

R E P O R T R E S U M E S

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STUDIES OF THE EFFECTS OF SYSTEMATIC VARIATION OF CERTAIN
CONDITIONS RELATED TO LEARNING. III. TASK CONDITIONS.

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A SERIES OF RESEARCH PROGRAMS CONCERNED WITH THE EFFECTS
OF SYSTEMATIC VARIATIONS OF CERTAIN CONDITIONS RELATED TO
LEARNING HAS BEEN CONDUCTED. PROJECTS PREVIOUSLY REPORTED
INCLUDED TWO INVESTIGATIONS OF REINFORCEMENT AND SUBJECT
VARIABLES AND ONE ON THE STUDY OF PRACTICE AND SUBJECT
VARIABLES. THE NATURE OF THE OVERALL PROGRAM WAS DISCUSSED IN
DETAIL IN AN EARLIER REPORT (BLAKE, 1961). THIS
INVESTIGATION, THE FOURTH OF THE SERIES, DEALT WITH THE
EFFECTS OF SYSTEMATIC VARIATIONS IN TASK CONDITIONS ON THE
LEARNING PERFORMANCE OF INTELLECTUALLY RETARDED,
INTELLECTUALLY NORMAL, AND INTELLECTUALLY SUPERIOR STUDENTS.
THE SUBJECT POPULATION CONSISTED OF STUDENTS REPRESENTING
DIFFERENT CHRONOLOGICAL AND MENTAL AGES. THE SUBJECTS WERE
ADMINISTERED TASKS IN WHICH THE CHARACTERISTICS OF THE
MATERIALS AND PROCEDURES WERE SPECIFIED BY SEVERAL
OVERLAPPING TASK CONDITIONS--TYPE OF MATERIAL, RESPONSE,
LEVEL OF LEARNING, AND ABSTRACTNESS. THE CRITERION MEASURE
WAS THE NUMBER OF ITEMS WHICH THE SUBJECT COMPLETED
SUCCESSFULLY ON TESTS AFTER A SPECIFIED NUMBER OF TASK
TRIALS. IT WAS CONCLUDED THAT TASK COMPLEXITY, ABSTRACTNESS
LEVEL, TASK LENGTH, METHOD OF APPROACH, AND TYPE OF
PRESENTATION AFFECT LEARNING. LIMITATIONS TO THE FINDINGS ARE
DISCUSSED. (JC)

**Studies of the Effects of Systematic Variations
of Certain Conditions Related to Learning
III. Task Conditions**

**U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
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Cooperative Research Project No. 1356

**Kathryn A. Blake, Project Director
with the cooperation of
Charlotte L. Williams
Norma W. Galbreath
Rebecca S. Dover
and others**

The University of Georgia

and

The Clarke County (Georgia) School District

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Clarke County (Georgia) School District

Mr. Sam W. Wood, Superintendent; Mr. Alton A. Ellis, Associate Superintendent.

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Clarke County Junior High School. Principal: Mr. A. Q. Hagen. Counsellor: Dr. Florence Rambo. Secretary: Mrs. Ruth Denman. Receptionist: Mrs. Louise Thompson. Teachers: Miss Lucy Clark, Mrs. Margaret Dunson, Mrs. Estelle Farmer, Mrs. Kathryn Jackson, Mrs. Louise Jones, Mrs. Louisa Lee, Mrs. Blanche Lumley, Mrs. Legene Mullis, Miss Annie Obenshain, Mrs. Alice Oliver, Mrs. Caroline Ridlehuber, Mrs. Mary Shoemaker, Mrs. Helen Wilencheck.

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Oconee Street School. Principal: Miss Annie Wallace. Teachers: Mrs. Dycie Campbell, Mrs. Edith Day, Mrs. Clara Doster, Mrs. Virginia Evans, Mrs. Gertrude Martin, Mrs. Victoria Thurman, Mrs. Jeanette Youngerman.

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Miss Cathy Westbrook contributed to the proofreading of the final manuscript; also, they collated and checked the material for the final report.

While those who are named in this prefatory statement made valuable contributions to the improvement of and the completion of the research, the project director alone bears the entire and final responsibility for any errors and inadequacies in planning, execution, interpretation, and reporting.

K. B.

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CHAPTER I

PROBLEM

Purpose and Objectives

The purpose in this investigation was to study how selected task administration, task materials, and subject variables influence children's and adolescents' learning.

The task administration variables were type of presentation of the material (oral-visual, oral) and type of approach or response activity required (induction, demonstration, deduction). The task materials variables consisted of level of complexity of the stimulus and response combinations (rote learning, concept formation, problem solving), level of abstractness of the material (nonsense syllables, object level, first level, second level), and length of task (four, eight, and twelve units). The subject variables included intelligence level, chronological age level, mental age level, and sex.

The specific objectives were to examine the following.

1. Effects of task complexity
2. Effects of task abstractness singly and combined with task complexity.
 - a. Task abstractness
 - b. Task abstractness X task complexity
3. Effects of task length
4. Effects of method of approach singly and combined with the task materials variables
 - a. Method of approach
 - b. Method of approach X task complexity
 - c. Method of approach X task abstractness
 - d. Method of approach X task length
5. Effects of type of presentation singly and combined with method of approach and the task materials variables
 - a. Type of presentation
 - b. Type of presentation X method of approach
 - c. Type of presentation X task complexity
 - d. Type of presentation X task abstractness
 - e. Type of presentation X task length

6. Effects of intelligence level (MA and CA respectively held constant) singly and combined with the task materials variables.
 - a. Intelligence level (MA=, CA≠)
 - b. Intelligence level (MA=, CA≠) X task complexity
 - c. Intelligence level (MA=, CA≠) X task abstractness
 - d. Intelligence level (MA=, CA≠) X task length
 - e. Intelligence level (CA=, MA≠)
 - f. Intelligence level (CA=, MA≠) X task complexity
 - g. Intelligence level (CA=, MA≠) X task abstractness
 - h. Intelligence level (CA=, MA≠) X task length
7. Effects of sex singly and combined with the task materials variables.
 - a. Sex
 - b. Sex X task complexity
 - c. Sex X task abstractness
 - d. Sex X task length

Education Significance

Baldwin (1960, pp. 3-4) succinctly portrayed the educational importance of basic research related to child behavior and development. In his commentary, he cited some difficulties and stressed the need for "solid empirical data on fundamental processes". Then, he concluded:

A great quantity of research in problems of learning, language development, and thinking, among others, must be carried out, confirmed, and then applied to the practical problems of education.

The focus of the present investigation is consistent with Baldwin's conclusion. That is, the investigation involved examining task and subject variables important in learning.

This investigation is the fourth in a research program, Studies of the effects of systematic variations of certain conditions related to learning. Already completed projects in the research program include two investigations of reinforcement and subject variables (Blake, 1959; Blake, Donlon, Fleigler, and Trippe, 1961) and one study of practice and subject variables (Blake, 1961). The nature of the research program was discussed in detail in an earlier report (Blake, 1961). Briefly, the orientation of the research program is that investigations of variables related to learning are significant for the field of education in this sense: educational decisions

are predicated upon a number of bases; one of these bases is the manner in which pupils learn; consequently, making the most efficient educational decisions is facilitated by a body of information about how pupils respond to the variables of which learning is a function. The educational significance of the present study is in its contribution to such a body of information.

Related Research

In general, a few investigators have studied how learning is affected by the task administration, task materials, and subject variables selected for examination herein. Representative investigators include Barnett, Ellis, and Pryer (1960), Hilgard, Irvine, and Whipple (1953), Hovland (1940), Johnson and Blake (1960), Koch (1930), and Long and Welch (1942). The results reported by these and other investigators are cited in Chapter IV where the results of the present study are discussed. In sum, the few investigations which have been made have yielded some valuable information; yet, important problems remain.

1. Some problems pertain to effects and interaction effects of task variables per se. In most of the previous research, adults were employed as subjects; the generality of the results when children and adolescents are sampled needs to be evaluated. The majority of the investigations involved study of a single task variable; the interaction effects of several task variables need further scrutiny. In much of the work, the effects of subject variables were not considered systematically to any great extent; the interaction effects of task variables and appropriate subject variables need to be examined.
2. Some problems relate to effects of subject variables per se. In previous investigations, the range or heterogeneity of the scores reflecting the subject variable being considered was rather narrow; consequently, there are possibilities that spurious attenuation of relationships may have occurred as a function of restriction of score variation and this may limit implications of the results. Also, in some of the investigations, only more mature subjects were used; again, the problem of the generality of the results to children and adolescents merits consideration.

3. Some problems are germane to the interaction effects of subject and task variables. Much of the previous information was based on inferences from results of several separate studies; these inferences need to be evaluated within the framework of a unified, systematic investigation. An insufficient variety of tasks was employed and, of the tasks used, there was a problem of range of task difficulty; more work needs to be done involving tasks dimensionalized on the basis of several characteristics and tasks dimensionalized in such a way that the appropriateness of both the lower limits and upper limits of the task is taken into consideration. And, as in the other situations, much of the information is based upon research in which adults were sampled; again, an examination of the generality of the results when children and adolescents are employed as subjects is needed.

In essence, these problems may be reduced to two basic needs: the need to evaluate the generality of results obtained with adult samples when children and adolescents are sampled; and, the need to evaluate in one comprehensive investigation or consistent setting the effects and interaction effects of several subject and task variables, both classes of which are dimensionalized systematically and sufficiently. Comments by Baldwin (1960), Bijou and Baer (1960), McGeoch and Irion (1952), Munn (1954), Norton (1959), Spiker (1960), and Underwood (1949, 1964) are relevant to these needs and the merits of the approach adopted in the present investigation. Specifically, the points made by McGeoch and Irion (1952, p. 462) still are illustrative.

The observation has often been made in everyday activities and in the laboratory that apparently equal amounts of different materials take varying amounts of time to learn. This observation leaves no doubt that rate of learning is a function of the character of the materials learned. We wish to go beyond this, however, and to know how much the rate varies with specified changes in particular dimensions of the material. In the case of many learning situations, comparisons have not been made of rates of learning as a function of the dimensions along which the materials are distributed.

McGeoch and Irion considered that more of this type of work had been done in relation to verbal materials; yet, throughout their discussion of research pertinent to the topics of interest herein, they maintained that the effect of varying any one aspect of the task materials or the task administration procedures partially was contingent upon other aspects of the material per se, other aspects of the administration of the material, and characteristics

of the subjects. In one summary statement (1952, p. 487) they said: "The problem is to find the relationship and the conditions with which it varies." This statement precisely reflects the concern in the present investigation.

PROCEDURE

Research Design

The basic research design illustrated in Figure 1 was used in obtaining data relevant to the specific research objectives encompassing effects and interaction effects of the task administration, task materials, and subject variables on learning. Briefly, the subjects were given tasks under overlapping dimensions of the task administration variables; the characteristics of the tasks were defined by overlapping dimensions of the task materials variables. The overlapping dimensions of the two task materials variables yielded 12 tasks; the overlapping dimensions of the two task administration variables yielded six treatments. The overlapping dimensions of the subject variables yielded samples of intellectually retarded, normal, and superior male and female children and adolescents.

The several aspects of this research design are described more fully below in terms of these topics: subjects, task materials variables, task administration variables, general procedures, and data analysis procedures¹.

¹N.B.: In the text and in Appendices A, B, C, D, E, and F, details about procedures, directions, and basic task materials are presented out of context and are organized for brevity of presentation in the final report. Appendix G contains an example of an investigator's administration book for one direct learning task. This administration book portrays for one task how the directions, procedures, and content for the task materials variables and the task administration variables were organized for presentation to the subjects. Generally, for all direct learning sessions, the following sequence of activities was employed: introductory comments, directions and procedures for the task materials variables, ~~the~~ directions and procedures for the method of approach variants, recapitulation of basic directions for the task materials variables, directions and procedures for the type of presentation variants, recapitulation of any directions and procedures to the extent necessary to insure that the subjects understood what they were to do, and then administration of the task materials per se.

The entire session with the subjects also included administration of retention tasks (after the first session) and parallel tasks.

Figure 1

Research Design

Type of presentation		Oral-Visual			Oral		
Method of approach		Induction	Demonstration	Deduction	Induction	Demonstration	Deduction
Level of Complexity	Level of abstractness	Base Cell Groups	Base Cell Groups	Base Cell Groups	Base Cell Groups	Base Cell Groups	Base Cell Groups
Rote Learning	Nonsense syllables						
	4 Object level words						
Concept Formation	8 Object level words						
	12 Object level words						
Problem Solving	Nonsense syllables						
	Object level words						
	First level words						
	Second level words						

Subjects

The subject variables were CA, MA, IQ, and sex. Details about subject selection are presented below in terms of five topics: definitions of terms, selection criteria, selection procedures, assignment to subsamples and treatment subgroups, and descriptive and inferential statistics relevant to the subject variables.

Definitions of Terms

For the purposes of this investigation, terms employed in reference to the samples were defined as follows.

1. Intelligence quotient. Deviation IQ based on the MA obtained on the Form L-M of the Stanford-Binet Test of Intelligence, 1960 Revision and as presented in the Pinneau Revised IQ Tables (Terman and Merrill, 1960; Pinneau, 1960, p. 257, et. seq.).
2. Mental age. Index reflecting the total number of items successfully completed by the subject on the Form L-M of the Stanford-Binet Test of Intelligence, 1960 Revision.
3. Chronological age. Age determined by subtracting the subject's birth date from a specified date prior to the initiation of the task administration.
4. Intellectually retarded subjects. Subjects whose IQ's are between 50 and 89.
5. Intellectually normal subjects. Subjects whose IQ's are between 90 and 119.
6. Intellectually superior subjects. Subjects whose IQ's are 120 or higher.

Selection Criteria

Selected for inclusion in the research were Caucasian public school pupils whose characteristics were consistent with the following criteria.

1. Intelligence quotients which were 50 or higher.
2. CA's between 7 years and 16 years.
3. Reading grade placement and arithmetic grade placement which were first grade level or above.

4. Absence of physical, sensory, or emotional deviations which are sufficiently severe to interfere with performance in the research situation.

Selection Procedures

Subjects were selected from four elementary schools and one central junior high school in the Clarke County (Georgia) School District. Lists of prospective subjects were established on the basis of information contained in pupil records. When indicated, principals, guidance counsellors, and teachers were consulted about individual pupils. Pupils whose characteristics tentatively were consistent with the selection criteria were administered the Form L-M of the Stanford-Binet Test of Intelligence, 1960 Revision. Of these pupils, 261 whose IQ's generally were consonant with psychometric and achievement test data contained in school records were selected as subjects.

Subject selection and task administration were conducted during two academic years. Subjects in the elementary schools were contacted during the first year (1961-1962); subjects in the junior high school, during the second year (1962-1963). For each year, the subjects' CA's and MA's were prorated as of a single date just prior to the day the first tasks were administered.

Assignment to Subsamples and Treatment Subgroups

The combination of the task materials variables yielded 12 tasks. Because the administration of 12 tasks to each subject would have required that the subject be absent from his classes for an inordinate amount of time, the tasks were divided into two sets of six each. Similarly, the total sample was divided randomly into two subsamples. The combination of the task administration variables necessitated six treatment subgroups. Therefore, a set of six treatment subgroups was required for each subsample. Subjects in each subsample were assigned randomly to the two respective sets of six treatment subgroups. The tables of random numbers and procedures described by Edwards (1950) were used in the randomization process for establishing both the subsamples and the treatment subgroups. The treatment subgroups in one subsample were labeled base cells(BC) 1-6,

respectively; the treatment subgroups in the other subsample, base cells (BC) 7-12, respectively.

Descriptive and Inferential Statistics Relevant to the Subject Variables

Because the tasks involved learning or determining relationships between digits and nonsense syllables and between digits and words classified in various ways, the subjects' scores on two control variables were obtained. One control variable was score on a vocabulary task designed to reflect a subject's ability to classify the nonsense syllables and words used in the tasks into the categories used in the tasks; the other control variable was score on a digit recall task designed to reflect a subject's ability to recall the lists of digits used in the task. These tasks were administered after the subjects had completed all other direct learning, retention, and parallel tasks specified for their base cell. Appendix E contains the materials, directions, and procedures for both the vocabulary tasks and the digit recall tasks. Vocabulary I and Digit Recall I were administered to subjects in base cell groups 1-6; Vocabulary II and Digit Recall II, to subjects in base cell groups 7-12.

Descriptive statistics¹ portraying characteristics of the subjects in the several base cell groups and intelligence groups are presented in Tables 1, 2, and 3. Table 1 contains information about CA, MA, and IQ; Table 2, about scores on the vocabulary and digit recall tasks; Table 3, about the sex distribution.

A single classification analysis of variance design (Lindquist, 1953) was used to evaluate the MA, CA, IQ, vocabulary, and digit recall data. The .05 probability level was the criterion for rejecting null hypotheses.

Table 4 contains prime data yielded by the analyses of variance among means of subjects classified by base cells and by intelligence levels. The analyses of the means of the base cell groups yielded no significant F-ratios. All analyses of the means of the intelligence groups yielded significant F-ratios. For IQ, MA, vocabulary, and digit recall, the mean

¹Numbers of subjects indicated in Table 1 and Table 2 and for the degrees of freedom in the several analyses in Table 4 differ because several subjects were absent during the administration of the vocabulary and digit recall tasks.

Table 1

Intelligence Quotients, Chronological Ages, and Mental Ages
of Subjects Grouped by Base Cell and by Intelligence Level:
Means and Standard Deviations

Group	Number of Subjects	Intelligence Quotient		Mental Age (months)		Chronological Age (months)	
		$\bar{X}$	S	$\bar{X}$	S	$\bar{X}$	S
BC 1	21	109.48	24.13	160.33	35.91	147.76	24.78
BC 2	20	106.70	24.88	155.50	41.58	144.10	20.71
BC 3	22	111.95	25.30	161.18	42.72	144.41	29.21
BC 4	23	106.30	23.16	143.78	39.16	135.22	29.51
BC 5	22	105.50	23.31	155.09	37.23	147.73	21.50
BC 6	22	108.77	27.58	151.96	49.67	139.36	26.04
BC 7	23	112.17	22.29	156.61	37.39	139.13	25.41
BC 8	20	113.20	24.83	166.20	38.30	149.05	28.18
BC 9	23	111.30	25.15	156.74	38.18	141.83	26.48
BC 10	18	115.12	21.38	170.83	33.68	146.22	18.01
BC 11	23	112.17	26.98	164.00	39.24	147.13	23.67
BC 12	24	108.67	25.45	152.54	39.76	140.00	25.47
Retarded	62	77.56	9.54	119.51	23.92	159.65	29.11
Normal	100	105.49	8.75	149.36	25.59	139.50	22.28
Superior	99	134.88	10.44	187.70	37.66	134.86	23.23

Table 2

Vocabulary and Digit Recall Task Scores of Subjects Grouped by
Base Cell and by Intelligence Level:
Means and Standard Deviations

Group	Vocabulary Task			Digit Recall Task		
	N	$\bar{X}$	S	N	$\bar{X}$	S
BC 1	19	54.26	9.87	19	53.79	14.89
BC 2	16	50.94	12.93	16	49.44	16.10
BC 3	21	55.05	7.93	21	48.90	17.75
BC 4	22	52.78	8.39	23	43.87	12.55
BC 5	22	55.95	7.33	22	54.82	13.85
BC 6	22	52.05	13.22	22	52.95	20.54
BC 7	19	55.58	5.61	19	46.58	12.81
BC 8	18	53.56	6.61	18	55.06	17.08
BC 9	22	53.27	7.38	22	49.77	14.12
BC 10	17	55.47	5.21	13	53.85	14.29
BC 11	22	55.00	6.85	22	50.09	18.84
BC 12	21	49.00	14.82	21	44.05	20.07
Retarded	58	48.48	11.43	57	42.82	14.60
Normal	94	53.40	9.40	93	47.01	15.51
Superior	89	56.88	5.81	86	57.92	15.73

Table 3

Distribution of Males and Females: Subjects Grouped
by Base Cell

Base Cell	Total Number of Subjects	Number of Males	Number of Females
1	21	14	7
2	20	10	10
3	22	12	10
4	23	12	11
5	22	12	10
6	22	10	12
7	23	10	13
8	20	7	13
9	23	14	9
10	18	9	9
11	23	12	11
12	24	13	11
Total	261	135	126 .

Table 1

Results of Analyses of Variance Among Means for the Subject Characteristics

A. Subjects Grouped by Base Cell

Subject Variable	Source of Variation	Degrees of Freedom	Mean Square
Intelligence Quotient	Between Within	11 249	190 608
Mental Age	Between Within	11 249	1090 1574
Chronological Age	Between Within	11 249	399 621
Vocabulary Task Score	Between Within	11 229	89 88
Digit Recall Task Score	Between Within	11 224	31.7 268

B. Subjects Grouped by Intelligence Level^{a,b}

Subject Variable	Source of Variation	Degrees of Freedom	Mean Square
Intelligence Quotient	Between Within	2 258	64,269*** 92
Mental Age	Between Within	2 258	92,625*** 923
Chronological Age	Between Within	2 258	12,425*** 596
Vocabulary Task Score	Between Within	2 238	1,238*** 78

Table 4 (continued)

Subject Variable	Source of Variation	Degrees of Freedom	Mean Square
Digit Recall Task Score	Between Within	2 233	4,580*** 236

*** $P < .001$

^aPaired comparisons (t -tests) revealed the following simple effects:
IQ, MA, Vocabulary-- $R < N$, $R < S$, $N < S$; Digit Recall-- $R = N$, $R < S$, $N < S$;
CA-- $R > N$, $R > S$, $N = S$.

^bCorrelations of MA's and Vocabulary Task Scores: total, .57; between means, .97; within, .49. Correlations of MA's and Digit Recall Task Scores: total, .69; between means, .99; within, .63.

of the superior group was higher than the means of the normal and retarded groups, and, except for digit recall, the mean of the normal group was higher than the mean of the retarded group. For CA, the mean of the retarded group was higher than the means of the normal and superior groups, and the mean of the normal group was equivalent to the mean of the superior group.

The inferential data would seem to indicate the following. Populations sampled in the several base cell groups are homogeneous with respect to the subject characteristics analyzed: viz., MA, CA, IQ, vocabulary, and digit recall. Populations sampled in the three intelligence groups are not homogeneous in terms of these characteristics. The differences are in the expected direction. That is, superior pupils exceed retarded and normal pupils in IQ, MA, vocabulary, and digit recall; normal pupils exceed retarded pupils in all of these except digit recall. Retarded pupils exceed normal and superior pupils in CA; normal and superior pupils are similar in CA.

Task Materials Variables

Three types of tasks were developed. These were labeled direct learning tasks, retention tasks, and parallel tasks.^{1,2}

¹Extensive pilot testing was required during the task development phase. Pilot test subjects included over 200 pupils selected from grades 2 through 12 of the public schools.

²The present final report includes the materials, directions, and procedures for the retention and parallel tasks as well as the direct learning tasks. The purpose for including all of this information herein is to portray the total situation the subjects encountered during the administration sessions. However, only data reflecting the subjects' direct learning performance could be analyzed and interpreted. This more limited presentation is consistent with the commitment made in the original prospectus. Such a limited presentation is necessary because sufficient time and funds were not available for the extensive and complex work of analyzing and reporting data for the retention and parallel tasks. As soon as time and funds can be obtained, a report will be made of results relevant to these retention and parallel tasks.

The original prospectus included plans only for 12 direct learning tasks. However, for reasons related to school management, the subjects had to remain with an investigator during an entire 50-minute class period. Because administering the direct learning tasks did not require this much time, the investigators developed 12 retention tasks which corresponded with the 12 direct learning tasks. In turn, administering a retention task and a direct learning task during any one administration session necessitated activities to interpolate between the two types of tasks in order to minimize the possibilities of either positive or negative transfer. Therefore, the investigators developed the following: a set of explicit comments referring to expectations about differences between similar appearing tasks; parallel tasks which consisted of formats, activities, sets, etc. which were different from those involved in the direct learning and retention tasks. The sequence for presenting these materials during the administration sessions was the following: retention task (after the first session), parallel task, the set of explicit comments, direct learning task.

The several tasks are considered subsequently in terms of the following topics: definitions of terms, specific characteristics of the direct learning tasks, general characteristics of the direct learning tasks, the retention tasks, and the parallel tasks.

Definitions of Terms

For the purposes of the investigation, the following definitions of terms were employed in reference to the task materials.

1. Learning. Change in the response measure in the expected direction under the conditions of practice (McGeoch and Irion, 1952, p. 5)
 - a. Direct learning. Learning performance of the subject during and immediately after practice on the task.
 - b. Retention of learning. Learning performance of the subject after an interpolated time interval in which he has no overt practice on the task.
2. Level of complexity. Number of, and relationships among, the stimulus and response elements involved in the task. (Underwood, 1949, especially pp. 5, 40, 49, 84, 341, and 429).
 - a. Rote learning. Association and integration of a series.

of discrete responses to a series of discrete stimuli. Emphasis is upon the correct response being a function of the arbitrary association between the several pairs of discrete stimuli and responses.

- b. Concept formation. Association of a single response to single representatives of a group of stimuli which are categorized on the basis of a common underlying attribute. Emphasis is upon the correct response being a function of a generalizing process which follows a discrimination of similarities and differences among the stimuli.
 - c. Problem solving. Association of a single response to a principle or a relationship among a series of discrete stimuli. Emphasis is upon the correct response to an item being a function of a contingency relationship among the discrete or single stimuli involved.
3. Level of abstractness. Degree of meaningfulness of material in the sense of the breadth or inclusiveness of its conventional association value.
- a. Nonsense syllables. Consonant-vowel-consonant triads which have minimum conventional association values; that is, words which have no conventional referents.
 - b. Words at the object level. Common words which have conventional association values in the sense that they directly reflect the objects for which they stand; that is, words which have conventional concrete object referents, e.g., apple.
 - c. Words at the first level of abstractness. Common words which reflect groups of words at the object level; that is, words which have conventional class referents, e.g., fruit.
 - d. Words at the second level of abstractness. Common words which reflect groups of words at the first level of abstractness; that is, words which have conventional category referents, e.g., food.

Actually, the definitions of terms of abstractness cited here represent a combination of two dimensions, meaningfulness and abstractness, as the terms usually are defined operationally. Meaningfulness refers to ". . . the number of associations which a word elicits in a limited period of time" or ". . . the per cent of subjects who give an association in a limited period of time" (McGeoch and Irion, 1952, p. 469; Underwood, 1949, p. 410). Abstractness refers to the degree of the "thing like" attributes of the situation reflected by the symbol or label; that is, the closeness of the symbol to its concrete referent. Various levels of abstractness are reflected by the number of times successive new abstractions have been made from former abstractions (Gray and Wise, 1959; Hayakawa, 1933; Long and Welch, 1942). Thus, there are definitional problems. As McGeoch and Irion

and Underwood pointed out: "... the dimensions of meaning may be further analyzable, and there may be other dimensions related to it . . ." (McGeoch and Irion, 1952, p. 472); "In the future, level of abstractness may be shown to be a special case of meaningfulness as we (now define it)" (Underwood, 1949, p. 445); these two authors present evidence and raise questions about the possible relationship between the two dimensions. The present investigator is aware of these definitional problems. She recognized that level of abstractness, as defined and dimensionalized herein, involves a curvilinear situation in terms of "degree of familiarity", which is inherent in the definitions of both meaningfulness and abstractness. However, a practical decision had to be made and a number of pertinent sources was consulted; finally, the decision made here was directed by a basic interest in this phase of the study. This interest, reflected in the selection of both the level of abstractness and level of complexity variables, was to parallel aspects of the situation which occurs in the acquisition and manipulation of verbal symbols (Gray and Wise, 1959; Heidbreder, 1936; Johnson, 1946; Lee, 1941; Russell, 1956; Vinacke, 1953): to wit., responding in various ways to stimuli which have minimum association value or meaning (nonsense syllables), to stimuli which have meaning at the concrete stage (words at the object level), and to stimuli which have association value or meaning at higher or broader levels of inclusiveness (words at the first and second levels of abstractness).

Specific Characteristics of the Direct Learning Tasks

Twelve direct learning tasks were developed. The response units for these tasks were two-digit numerals. The stimulus units were words or nonsense syllables. The characteristics of the tasks were defined primarily by the overlapping dimensions of the task materials variables. Complexity level encompassed three variants: rote learning, concept formation, and problem solving. Abstractness level included four variants: nonsense syllables, words at the object level, words at the first level of abstractness, and words at the second level of abstractness. In addition, in the rote learning tasks, the variable length was substituted for the two higher levels of abstractness¹.

¹Fully dimensionalizing the rote learning materials in terms of abstractness level probably would have resulted in the subjects' reducing the words at the first and second levels of abstractness to object level words. Therefore, the rote learning materials were dichotomized between nonsense syllables and words at the object level; and then, the lists of words at the object level were dimensionalized according to length--four, eight, and twelve units.

The names of the tasks were specified by the combination of variants involved. That is, the tasks were labeled as follows: rote learning--nonsense syllables, rote learning--four object level words, rote learning--eight object level words, rote learning--twelve object level words; concept formation--nonsense syllables, concept formation--words at the object level, concept formation--words at the first level of abstractness, concept formation--words at the second level of abstractness; problem solving--nonsense syllables, problem solving--words at the object level, problem solving--words at the first level of abstractness, and problem solving--words at the second level of abstractness. These task names were abbreviated in a corresponding way: e.g., RL-NS, CF-OL, PS-1L.

The twelve tasks are described below in terms of the following: the model on which the task was based; the specific elements included in the task; the composition of the trial (training) lists and the test lists; the number of times the trial lists and test lists were presented; and reference to the appendix containing the procedures, directions, administrative sequences, and basic task materials. During the data collection phase, all of these materials for each task were contained in administration manuals used by the investigators in working with the subjects. As an example, the administration manual for one task (Task 5: Concept Formation--Words at the First Level of Abstractness) is presented in Appendix G.

Rote Learning Tasks

The rote learning tasks were based on the anticipation model for paired associate learning described by Underwood (1949). Each task involved two presentations of three lists of stimulus-response pairs; the several lists consisted of the basic set of pairs arranged in different orders. For each task, the test lists consisted of the stimulus-response pairs involved in the task; the test list was administered after each trial list presentation. Appendix A includes the detailed procedures, directions, administrative sequences, and basic task materials for the rote learning tasks. The specific activity for each task is listed below.

1. Task 1: Rote Learning--Nonsense Syllables (RL-NS). Learning eight nonsense syllable--digit pairs.
2. Task 2: Rote Learning--Four Object Level Words (RL-OL4). Learning four word--digit pairs.

3. Task 3: Rote Learning--Eight Object Level Words (RL-OL-8).
Learning eight word--digit pairs.
4. Task 4: Rote Learning--Twelve Object Level Words (RL-OL-12).
Learning twelve word--digit pairs.

Concept Formation Tasks

The concept formation tasks were based on the concept learning model described by Spiker (1960). Each task consisted of four concepts presented concomitantly. In each task, twelve positive instances of each concept were presented one time. The test list for each task included two positive instances (additional to those used in the task) of each concept administered after each eight trials involving single presentations of two positive instances of each concept. Appendix B contains the detailed procedures, directions, administrative sequences, and basic task materials for the concept formation tasks. The specific activity for each task is listed below.

1. Task 5: Concept Formation--Nonsense Syllables (CF-NS).
Determining four sets of nonsense syllables grouped according to the following initial letters: V, G, K, and Z.
2. Task 6: Concept Formation--Words at the Object Level (CF-OL). Determining four sets of object level words grouped according to the following initial letters: F, L, S, and B.
3. Task 7: Concept Formation--Words at the First Level of Abstractness (CF-1L). Determining four sets of object level words grouped according to the following classes: trees, flowers, weather, and mammals.
4. Task 8: Concept Formation--Words at the Second Level of Abstractness (CF-2L). Determining four sets of object level words grouped according to the following categories: transportation, humans, invertebrate animals, and measurement.

Problem Solving Tasks

The problem solving tasks were based on the use of Mill's Joint Method of Agreement and Differences¹ to organize material. Each task consisted of four concepts presented concomitantly. In each task, three

¹As adapted and described by Long and Welch (Long and Welch, 1941, 1942; Welch, 1940a, 1940b; and Welch and Long, 1940).

positive and six negative instances of each concept were presented two times. The test list for each task included two positive instances (additional to those used in the task) of each concept administered after each presentation of one positive instance and two negative instances of each concept. Appendix C contains the detailed procedures, directions, administrative sequences, and basic task materials for the problem solving tasks. The specific activity for each task is listed below.

1. Task 9: Problem solving--Nonsense Syllables (PS-NS). Mill's Joint Method of Agreement and Differences applied to four sets of nonsense syllables grouped according to the following initial letters: M, T, J, and Y.
2. Task 10: Problem Solving--Words at the Object Level (PS-OL). Mill's Joint Method of Agreement and Differences applied to four sets of object level words grouped according to the following initial letters: R, P, W, and D.
3. Task 11: Problem Solving--Words at the First Level of Abstractness (PS-1L). Mill's Joint Method of Agreement and Differences applied to four sets of object level words grouped according to the classes: time, insects, fruit, and family.
4. Task 12: Problem Solving--Words at the Second Level of Abstractness (PS-2L). Mill's Joint Method of Agreement and Differences applied to four sets of object level words grouped according to the following categories: earth features, plants, vertebrate animals, and household articles.

General Characteristics of the Direct Learning Tasks

Subjects responded to all tasks by writing the response digits. For all tasks, the investigators presented the materials orally. In addition, since type of presentation was a treatment variable, half of the subjects received the stimulus materials in visual form; half did not.

No specific words, nonsense syllables, nor digits were repeated among the 12 tasks. First level concepts for the concept formation tasks were from the groups of first level concepts encompassed by the second level concepts of the problem solving tasks; first level concepts for the problem solving tasks were from the groups of first level concepts encompassed by the second level concepts for the concept formation

tasks¹.

Each task included presentation of several sets of trial (training) lists and test lists. Each trial consisted of one stimulus-response unit. Each test list contained the several stimulus-response units involved in the respective rote learning tasks or representatives of the several classes and categories involved in the respective concept formation and problem solving tasks.

The tasks were presented in the form of booklets. These booklets were made of half-sheets of 8 1/2" by 11" mimeograph paper. Each trial was put on a separate page; the several units of a test list were put on the same page. Heavy sheets of paper were inserted between each test list and the sets of trials which came before and after it.

The stimulus units were mimeographed on the pages; blank lines were mimeographed as the spaces for the subject to write his responses. The mimeographed materials were centered vertically and horizontally on the page.

Retention Tasks

The retention tasks were based on the 12 direct learning tasks described above. The retention task corresponding to any one direct learning task involved administering, after a one-week interval², the test list twice and the last sequence of trials for that task. Specifically, the retention task consisted of this administration sequence: test list, trial list, test list. The 12 retention tasks were numbered 13 to 24 corresponding to the numbering for the direct learning tasks: e.g., Rote Learning--Nonsense Syllables--Retention.

¹The tasks were divided between the two sets of base cells in such a way that no subject was exposed to concepts subsumed by the same categories on both the concept formation and problem solving tasks.

²One major exception in timing occurred. Between the fourth and fifth administration sessions, a two-week interval was necessary.

was numbered Task 13, Rote Learning--Four Object Level Words--Retention was numbered Task 14. The detailed procedures, directions, administrative sequences, and basic task materials for the retention tasks are presented in Appendix D.

Parallel Tasks

The several parallel tasks involved a variety of activities: e.g., motor facility, discrimination learning. Most of these consisted of six trials administered under a speed and accuracy set, written responses, and reactions on the basis of a model. These tasks were numbered from 25 to 53. The names and numbers of the tasks were the following: 25, Drawing a Fence; 26, Drawing a Man; 27, Numbers Forward; 28, Numbers Inverted; 29, Alphabet Forward; 30, Alphabet Inverted; 31, Number Cancellation; 32, Letter Cancellation; 33, Number Comparison; 34, Letter Comparison; 35, Ordinal Grouping--Letters; 36, Letter--Number Grouping; 37, Coding--Letter Digit; 38, Coding--Letter Letter; 39, Coding--Letter Symbol; 40, Coding--Digit Letter; 41, Coding--Digit Symbol; 42, True Equations--Digits; 43, Nonsense Equations--Digits; 44, Nonsense Equations--Letters; 45, Nonsense Equations--Symbols; 46, True Equations--Digit Letter; 47, True Equations--Digit Symbol; 48, Sarason TASC and GASC; 49, Vocabulary I; 50, Vocabulary II; 51, Digit Recall I; 52, Digit Recall II. Appendix E is composed of the procedures, directions, and administrative sequences for each of these parallel tasks.

Task Administration Variables

The direct learning and retention tasks were administered under combinations of variants resulting from the overlapping of the task administration variables--type of presentation and method of approach. Specifically, these six combinations of variants were the following: oral-visual presentation--inductive approach, oral-visual presentation--demonstration approach, oral-visual presentation--deductive approach; oral presentation--inductive approach, oral presentation--demonstration approach, oral presentation--deductive approach. The considerations involved in administering these variables are discussed below in terms of

two topics: definitions of terms, and characteristics of the task administration variables.

Definitions of Terms

For the purposes of this investigation, the following definitions of terms were used in reference to the task administration variables.

1. Type of presentation. Means by which the stimuli are administered to the subjects (McGeoch and Irion, 1952).
 - a. Oral presentation. Presentation in which the stimuli are administered orally; no visual cues are involved.
 - b. Oral-visual presentation. Presentation in which the stimuli are administered both orally and visually simultaneously.
2. Method of approach. Approach required for the subject to determine the correct responses ~~to the stimuli presented~~ (Leeper, 1951; Woodworth and Schlosberg, 1954).
 - a. Induction. Approach in which the subject is required to determine the correct responses to the stimuli by reference, after he makes his responses, to models in which the correct combinations of specific stimuli and responses are supplied.
 - b. Demonstration. Approach in which the subject is required to determine the correct responses to the stimuli by reference, before he makes his responses, to models in which the correct combinations of specific stimuli and responses are supplied.
 - c. Deduction. Approach in which the subject is required to determine the correct responses to the stimuli by reference, before he makes his responses, to models in which the basic stimulus-response pairs, concepts, or rules are supplied.

Characteristics of the Task Administration Variables

When receiving all variants, the subjects responded to the task administration by writing the response digits on the trial and test lists.

When he received the oral--visual type of presentation, the subject attended to the administrator presenting the stimulus orally and looked at the stimulus printed on his task booklet. When he received the oral type of presentation, the subject attended to the administrator presenting the stimulus orally but he had no stimulus printed on his

task booklet.

Subjects who used the inductive approach made a response to each trial after the stimulus was presented the first time but before the stimulus was presented again with the correct response and reinforcement. This ^{also} was the case for subjects who used the deductive approach. However, before the first series of trials and after each test list (i.e., before each subsequent series of trials), the subjects using the deductive approach were presented a complete list of the several letter-digit pairs in rote learning, the several concepts and the correct response digits in concept formation, and the organizational principle or rule of relationship in problem solving. For subjects who used the demonstration approach, the reverse of the procedure for the inductive approach was used; viz, the stimulus was presented with the correct response or reinforcement, then the stimulus was presented again and the subject responded.

The manner in which these several task administration variants were administered singly and in combination is illustrated in Figures 2, 3, and 4. Appendix F contains a detailed presentation of procedures and directions relevant to these task administration variants as they were prepared for the rote learning, concept formation, and problem solving tasks.

Figure 2

Sequence of Activities for the Type of Presentation Variants

Presentation Variant	Sequence of Activities			
	Stimulus presentation	Subject response	Reinforcement presentation	Test list presentation and subjects' response
Oral-Visual	Oral and printed (visual)	Written	Oral and written by subject	Oral and printed; written by subject
Oral	Oral but not printed (visual)	Written	Oral and written by subject	Oral and printed; written by subject

Figure 3
Sequence of Activities for the Method of Approach Variants

Approach Variant	Sequence of Activities (Trial example from concept formation)			
Induction	Stimulus presentation: <u>rose</u>	Subject response: <u> </u>	Stimulus presentation: <u>rose</u>	Reinforcement presentation: <u>2</u>
Demonstration	Stimulus presentation: <u>rose</u>	Reinforcement presentation: <u>2</u>	Stimulus presentation: <u>rose</u>	Subject response: <u> </u>
Deduction	Same sequence as induction except that the subject is presented, before each trial sequence, with the information that the digit 2 is associated with the class flower.			

Figure 4
Sequence of Activities for the Combined Type of Presentation and Method of Approach Variants

Brackets refer to item written by subjects; parentheses refer to item supplied orally by administrator; word or digit without brackets or parentheses refers to item printed in test booklet and supplied orally by administrator.

Approach Variant	Presentation Variant	Sequence of Activities
Induction	Oral-visual	rose [2] rose (2) [2]
	Oral	(rose) [2] (rose) (2) [2]
Demonstration	Oral-visual	rose (2) [2] rose [2]
	Oral	(rose) (2) [2] (rose) [2]
Deduction	Oral-visual	flower 2 rose [2] rose (2) [2]
	Oral	(flower) (2) (rose) [2] (rose) (2) [2]

General Procedures

The twelve sets of direct learning and retention tasks were ranked from Task 1 to Task 12 and assigned alternately to two sets of six tasks each. One set was administered to the subjects in base cells 1-6; the other set, to the subjects in base cells 7-12. Listed in Figure 5 are the tasks, the order in which they were administered as direct learning and retention tasks, and the base cell groups of subjects to whom they were administered. Figure 6 contains similar information for the parallel tasks.

Figure 5

Schedule of Direct Learning and Retention Tasks by Sessions

Session Number	Base Cells 1--6		Base Cells 7--12	
	Retention Tasks	Direct Learning Tasks	Retention Tasks	Direct Learning Tasks
1	none	CF-2L-D.L. (Task 8)	none	CF-1L-D.L. (Task 7)
2	CF-2L-Ret. (Task 20)	RL-OL (4)-D.L. (Task 2)	CF-1L-Ret. (Task 19)	RL-NS (DL) (Task 1)
3	RL-OL(4)-Ret. (Task 14)	PS-NS-D.L. (Task 9)	RL-NS (Ret.) (Task 13)	PS-OL-D.L. (Task 10)
4	PS-NS-Ret. (Task 21)	RL-OL(12)-D.L. (Task 4)	PS-OL-Ret. (Task 22)	RL-OL(8)-D.L. (Task 3)
5	RL-OL(12)-Ret. (Task 16)	PS-1L-D.L. (Task 11)	RL-OL(8)-Ret. (Task 15)	PS-2L-D.L. (Task 12)
6	PS-1L-Ret. (Task 23)	CF-OL-D.L. (Task 6)	PS-2L-Ret. (Task 24)	CF-NS-D.L. (Task 5)
7	CF-OL-Ret. (Task 18)	none	CF-NS-Ret. (Task 17)	none

Figure 6

Schedule of Parallel Tasks^a by Sessions

Session Number	Base Cells 1, 7	Base Cells 2, 8	Base Cells 3, 9	Base Cells 4, 10	Base Cells 5, 11	Base Cells 6, 12
1	(Task 25)	(Task 27)	(Task 29)	(Task 25)	(Task 27)	(Task 29)
	(Task 26)	(Task 28)	(Task 30)	(Task 26)	(Task 28)	(Task 30)
2	(Task 31)	(Task 32)	(Task 33)	(Task 34)	(Task 35)	(Task 36)
3	(Task 37)	(Task 38)	(Task 39)	(Task 40)	(Task 41)	(Task 41)
4	(Task 42)	(Task 42)	(Task 42)	(Task 42)	(Task 42)	(Task 42)
5	(Task 43)	(Task 44)	(Task 45)	(Task 46)	(Task 47)	(Task 42)
6	(Task 48)	(Task 48)	(Task 48)	(Task 48)	(Task 48)	(Task 48)
7	BC 1: (Task 49)	BC 2: (Task 49)	BC 3: (Task 49)	BC 4: (Task 49)	BC 5: (Task 49)	BC 6: (Task 49)
	BC 7: (Task 50)	BC 8: (Task 50)	BC 9: (Task 50)	BC 10: (Task 50)	BC 11: (Task 50)	BC 12: (Task 50)
	BC 1: (Task 51)	BC 2: (Task 51)	BC 3: (Task 51)	BC 4: (Task 51)	BC 5: (Task 51)	BC 6: (Task 51)
	BC 7: (Task 52)	BC 8: (Task 52)	BC 9: (Task 52)	BC 10: (Task 52)	BC 11: (Task 52)	BC 12: (Task 52)

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^aThe names corresponding to the above task numbers are the following: 25, Drawing a Fence; 26, Drawing a Man; 27, Numbers Forward; 28, Numbers Inverted; 29, Alphabet Forward; 30, Alphabet Inverted; 31, Number Cancellation; 32, Letter Cancellation; 33, Number Comparison; 34, Letter Comparison; 35, Ordinal Grouping--Letters; 36, Letter--Number Grouping; 37, Coding--Letter Digit; 38, Coding--Letter Letter; 39, Coding--Letter Symbol; 40, Coding--Digit Letter; 41, Coding--Digit Symbol; 42, True Equations--Digits; 43, Nonsense Equations--Digits; 44, Nonsense Equations--Letters; 45, Nonsense Equations--Symbols; 46, True Equations--Digit Letter; 47, True Equations--Digit Symbol; 48, Sarason TASC and GASC; 49, Vocabulary I; 50, Vocabulary II; 51, Digit Recall I; 52, Digit Recall II.

Diagramed in Figure 7 are the nature and sequence of the task administration variants which were given to the subjects in the several base cell groups. The type of presentation variants under which the subjects received a task were changed from task to task. The method of approach

Figure 7

Schedule of Task Administration Variants by Sessions^{a, b}

Type of Approach	Induction (1)		Demonstration (2)		Deduction (3)	
Type of Presentation	Oral-visual (1)	Oral (2)	Oral-visual (1)	Oral (2)	Oral-visual (1)	Oral (2)
Session 1	BC 1,7	BC 2,8	BC 3,9	BC 4,10	BC 5,11	BC 6,12
Session 2	BC 2,8	BC 1,7	BC 4,10	BC 3,9	BC 6,12	BC 5,11
Session 3	BC 1,7	BC 2,8	BC 3,9	BC 4,10	BC 5,11	BC 6,12
Session 4	BC 2,8	BC 1,7	BC 4,10	BC 3,9	BC 6,12	BC 5,11
Session 5	BC 1,7	BC 2,8	BC 3,9	BC 4,10	BC 5,11	BC 6,12
Session 6	BC 2,8	BC 1,7	BC 4,10	BC 3,9	BC 6,12	BC 5,11

a

The schedule here pertains only to the direct learning tasks. However, for the retention tasks, the same administration variants were used with one modification. The modification involved omitting the generalization given to subjects who received the deduction variant. In addition, the retention tasks were administered in the session subsequent to the corresponding direct learning tasks; therefore, in the schedule for the retention tasks, the session numbers in the extreme left column above would begin with Session 2 and continue through session 7.

b

The numbers in parentheses refer to code numbers for the administration variants, e.g: 1-2, inductive method--oral-visual presentation; 2-2, demonstration method--oral presentation.

variants remained the same: viz., induction, base cells 1 and 2 and 7 and 8; demonstration, base cells 3 and 4 and 9 and 10; deduction, base cells 5 and 6 and 11 and 12. In order to reduce the possibility of making Type G errors (Lindquist, 1953), it would have been more desirable to change the approach variants from task to task. However, the necessary assumption that the effect of moving from one variant to each other variant was equal could not be made because of the generalizations presented in conjunction the deduction variant. To change the induction and demonstration variants but not the deduction variant also might have led to a bias in the results.

The sessions in which the subjects were contacted were labeled administration sessions. Appendix G contains an example of an investigator's administration book for a direct learning task. This book portrays for one task how the directions, procedures, and contents for the task materials variables and task administration variables were organized for presentation to the subjects. Generally, for all direct learning sessions, the following sequence of activities was employed: introductory comments, directions and procedures for the task materials variable, directions and procedures for the method of approach variants, recapitulation of basic directions for the task materials variables, directions and procedures for the type of presentation variants, recapitulation of any directions and procedures to the extent necessary to insure that the subjects understood what they were to do, and then administration of the task materials per se.

The entire sessions with the subjects also included administration of retention tasks (after the first session) and parallel tasks. Figure 8 contains the combined schedule for tasks and administration variants by sessions.

The administration sessions were 50 minutes long. They were scheduled weekly for each base cell group. The one exception was between the fourth and fifth sessions; here, two weeks intervened. For each task, the base cell groups receiving the induction variants were contacted first; the demonstration variants, second; and the deduction variants, third.

Each of the several research personnel administered the various types of tasks and presentation and approach variants. The sessions were conducted in separate rooms in the subjects' schools. In general, the rooms were free from excessive or unusual noise or interruption. For some subjects, some task requirements were difficult. The subjects were reassured when

Figure 8

Combined Schedule for Tasks and
Administration Variants by Sessions

(Refer to Figures 5, 6, and 7 for names of tasks and variants corresponding to the code numbers presented in the figure.)

Session #	Activity	BC 1	BC 2	BC 3	BC 4	BC 5	BC 6	BC 7	BC 8	BC 9	BC 10	BC 11	BC 12
1	Retention Task #	--	--	--	--	--	--	--	--	--	--	--	--
	Retention Variants	--	--	--	--	--	--	--	--	--	--	--	--
	Parallel Task #	25,26	27,28	29,30	25,26	27,28	29,30	25,26	27,28	29,30	25,26	27,28	29,30
	Direct Learning Task #	8	8	8	8	8	8	7	7	7	7	7	7
	Direct Learning Variants	1-1	1-2	2-1	2-2	3-1	3-2	1-1	1-2	2-1	2-2	3-1	3-2
2	Retention Task #	20	20	20	20	20	20	19	19	19	19	19	19
	Retention Variants	1-1	1-2	2-1	2-2	3-1	3-2	1-1	1-2	2-1	2-2	3-1	3-2
	Parallel Tasks #	31	32	33	34	35	36	31	32	33	34	35	36
	Direct Learning Task #	2	2	2	2	2	2	1	1	1	1	1	1
	Direct Learning Variants	1-2	1-1	2-2	2-1	3-2	3-1	1-2	1-1	2-2	2-1	3-2	3-1

Figure 8 (continued)

Session #	Activity	BC 1	BC 2	BC 3	BC 4	BC 5	BC 6	BC 7	BC 8	BC 9	BC 10	BC 11	BC 12
3	Retention Task #	14	14	14	14	14	14	13	13	13	13	13	13
	Retention Variants	1-2	1-2	2-2	2-1	3-2	3-1	1-2	1-1	2-2	2-1	3-2	3-1
	Parallel Task #	37	38	39	40	41	41	37	38	39	40	41	41
	Direct Learning Task #	9	9	9	9	9	9	10	10	10	10	10	10
	Direct Learning Variants	1-1	1-2	2-1	2-2	3-1	3-2	1-1	1-2	2-1	2-2	3-1	3-2
4	Retention Task #	21	21	21	21	21	21	22	22	22	22	22	22
	Retention Variants	1-1	1-2	2-1	2-2	3-1	3-2	1-1	1-2	2-1	2-2	3-1	3-2
	Parallel Task #	42	42	42	42	42	42	42	42	42	42	42	42
	Direct Learning Task #	4	4	4	4	4	4	3	3	3	3	3	3
	Direct Learning Variants	1-2	1-1	2-2	2-1	3-2	3-1	1-2	1-1	2-2	2-1	3-2	3-1

Figure 8 (continued)

Session #	Activity	BC 1	BC 2	BC 3	BC 4	BC 5	BC 6	BC 7	BC 8	BC 9	BC 10	BC 11	BC 12
5	Retention Task #	16	16	16	16	16	16	15	15	15	15	15	15
	Retention Variants	1-2	1-1	2-2	2-1	3-2	3-1	1-2	1-1	2-2	2-1	3-2	3-1
	Parallel Task #	43	44	45	46	47	42	43	44	45	46	47	42
	Direct Learning Task #	11	11	11	11	11	11	12	12	12	12	12	12
	Direct Learning Variants	1-1	1-2	2-1	2-2	3-1	3-2	1-1	1-2	2-1	2-2	3-1	3-2
6	Retention Task #	23	23	23	23	23	23	24	24	24	24	24	24
	Retention Variants	1-1	1-2	2-1	2-2	3-1	3-2	1-1	1-2	2-1	2-2	3-1	3-2
	Parallel Task #	48	48	48	48	48	48	48	48	48	48	48	48
	Direct Learning Task #	6	6	6	6	6	6	5	5	5	5	5	5
	Direct Learning Variants	1-2	1-1	2-2	2-1	3-2	3-1	1-2	1-1	2-2	2-1	3-2	3-1

Figure 8 (continued)

Session #	Activity	BC 1	BC 2	BC 3	BC 4	BC 5	BC 6	BC 7	BC 8	BC 9	BC 10	BC 11	BC 12
7	Retention Task #	18	18	18	18	18	18	17	17	17	17	17	17
	Retention Variants	1-2	1-1	2-2	2-1	3-2	3-1	1-2	1-1	2-2	2-1	3-2	3-1
	Parallel Task #	49,50	49,51	49,51	49,51	49,51	49,51	50,52	50,52	50,52	50,52	50,52	50,52
	Direct Learning Task #	--	--	--	--	--	--	--	--	--	--	--	--
	Direct Learning Variants	--	--	--	--	--	--	--	--	--	--	--	--

reassurance appeared indicated and verbal praise was employed intermittently. Generally, adequate rapport with the subjects was considered to have been established and maintained.

Data Analysis Procedures

The procedures involved in analyzing the data are described below in terms of two topics: response measure and statistical techniques.

Response Measure

The response measure, or score, selected to reflect learning was number of items correctly completed on tests administered during the tasks. Six tests were used for each task.

With two exceptions, the test for each task contained eight items. The exceptions were the tests for the RL-OL-4 and RL-OL-12 tasks which involved four and twelve items, respectively. For the analyses of the effect of the task materials variables and the effects of intelligence level, the scores for these two tasks were transformed to correspond to the 8-item scales for the remaining tasks. The scores for the RL-OL-4 task were multiplied by 2; the scores for the RL-OL-12 task, by 2/3.

Appendices A, B, and C contain information about the content of the tests and the locations of the tests in the trial sequences of each task.

Statistical Techniques

Data relevant to effects of the task materials variables were examined by t-tests. When any two tasks involved the same subjects, procedures for correlated measures were used. These analyses included comparisons of tasks within the following sets: tasks administered to Base Cells 1-6 (RL-OL-4, RL-OL-12, CF-OL, CF-2L, PS-NS, PS-1L); tasks administered to Base Cells 7-12 (RL-NS, RL-OL-8, CF-NS, CF-1L, PS-OL, PS-2L). An example of these analyses is the comparison of CF-OL and CF-2L. When any two tasks involved different subjects, procedures for non-correlated measures were used. These analyses encompassed comparisons of tasks between the two sets listed above, e.g., the comparison of CF-OL and CF-NS.

Data germane to the effects of the task administration and subject variables were examined by analysis of co-variance procedures. Essentially,

when the effect of any one variable was being examined, the effects of other variables were held constant. The Kramer multiple range test was used to make paired comparisons for the task administration variables. The t -test procedure for evaluating differences between adjusted means was used to make paired comparisons for data pertinent to the effect of intelligence level with mental age and chronological age, respectively, held constant.

All statistical tests were made under the assumptions of fixed effects. The criterion for rejecting the null hypotheses was the .05 probability level.

References used in performing the statistical analyses and in interpreting the data are the following: Cochran and Cox (1957), Cooley and Lohnes (1962), Harvey (1960), Kramer (1956), Lindquist (1953), Snedecor (1956), Steele and Torrie (1960), and Waugh (1952).

CHAPTER III

STATISTICAL DATA

Presented in tabular form in this chapter are detailed statistical data resulting from the analyses of the subjects' scores. The content of the tables is the following: Tables 5 and 6--results related to the task materials variables; Tables 7 through 15, results related to the task administration and subject variables; Tables 16 through 18--results related to the intelligence level variable with MA and CA respectively held constant.

The content of the statistical tables is not reiterated or listed explicitly in the text. Instead, the tables are used as source tables for Chapter IV, Results and Discussion, where relationships reflected by the statistics are reorganized and summarized in terms of the specific research objectives listed in Chapter I. Readers interested in the more technical and abstract statistical information may read the tables directly for themselves. For general readers, the contents of Chapter IV will furnish information about relationships indicated by the data while the contents of the present chapter will remain a reference to be consulted about specific points.

Several comments about mechanics of presentation are germane. First, the numerals in the tables are rounded by conventional procedures; the statistical analyses involved unrounded numbers. Second, only prime statistical data are tabulated. The interested reader may compute figures not presented by using the tabulated data; e.g., an F-ratio may be obtained by dividing the corresponding mean square for a main effect by the appropriate mean square error. Third, the numbers of subjects and degrees of freedom appearing in conjunction with the several analyses vary slightly; this variation resulted from differing numbers of absentees during the several task administrations.

Table 5

Means and Standard Deviations for the Twelve Tasks

Task	Number of Subjects	Means	Standard Deviations
RL-NS	117	2.499	1.737
RL-OL-4 ^a	123	4.778	2.279
RL-OL-8	120	4.204	2.106
RL-OL-12 ^b	124	2.725	1.764
CF-NS	119	2.709	2.463
CF-OL	108	2.431	2.612
CF-1L	114	3.586	2.675
CF-2L	116	2.803	2.751
PS-NS	120	1.052	1.315
PS-OL	120	0.610	1.032
PS-1L	121	1.612	2.191
PS-2L	119	0.733	1.014

a,b - Note: the means and standard deviations for the RL-OL-4 and the RL-OL-12 tasks were based on scores transformed to correspond to an 8-unit scale by multiplying the scores by 2 and 2/3, respectively (Chapter II, Response Measure).

Table 6

Results of *t*-tests of Differences Between Means for the Twelve Tasks

Comparison	$\bar{Y}_i - \bar{Y}_j$	df	<i>t</i> -ratio	Relationship
RL-NS : RL-OL-4	2.279	238	12.320***	RL-NS < RL-OL-4
RL-NS : RL-OL-8	1.818	107	13.488***	RL-NS < RL-OL-8
RL-NS : RL-OL-12	0.226	239	1.417	RL-NS = RL-OL-12
RL-NS : CF-NS	0.302	107	1.319	RL-NS = CF-NS
RL-NS : CF-OL	0.068	223	0.325	RL-NS = CF-OL
RL-NS : CF-1L	1.129	105	5.405***	RL-NS < CF-1L
RL-NS : CF-2L	0.304	231	1.426	RL-NS = CF-2L
RL-NS : PS-NS	1.447	235	10.227***	RL-NS > PS-NS
RL-NS : PS-OL	1.926	107	10.615***	RL-NS > PS-OL
RL-NS : PS-1L	0.887	236	4.895***	RL-NS > PS-1L
RL-NS : PS-2L	1.671	106	9.596***	RL-NS > PS-2L

Table 6 (continued)

Comparison	$\bar{Y}_i - \bar{Y}_j$	df	t-ratio	Relationship
RL-OL-4 : RL-OL-8	0.574	241	2.883**	RL-OL-4 > RL-OL-8
RL-OL-4 : RL-OL-12	1.967	117	12.425***	RL-OL-4 > RL-OL-12
RL-OL-4 : CF-NS	2.069	240	9.592***	RL-OL-4 > CF-NS
RL-OL-4 : CF-OL	2.226	100	8.694***	RL-OL-4 > CF-OL
RL-OL-4 : CF-1L	1.192	235	5.222***	RL-OL-4 > CF-1L
RL-OL-4 : CF-2L	2.005	108	9.116***	RL-OL-4 > CF-2L
RL-OL-4 : PS-NS	3.599	112	18.546***	RL-OL-4 > PS-NS
RL-OL-4 : PS-OL	4.168	241	25.969***	RL-OL-4 > PS-OL
RL-OL-4 : PS-1L	3.124	116	14.292***	RL-OL-4 > PS-1L
RL-OL-4 : PS-2L	3.995	240	24.916***	RL-OL-4 > PS-2L
RL-OL-8 : RL-OL-12	1.479	242	8.411***	RL-OL-8 > RL-OL-12
RL-OL-8 : CF-NS	1.373	110	5.967***	RL-OL-8 > CF-NS
RL-OL-8 : CF-OL	1.773	226	7.979***	RL-OL-8 > CF-OL
RL-OL-8 : CF-1L	0.711	104	3.455***	RL-OL-8 > CF-1L
RL-OL-8 : CF-2L	1.401	234	6.212***	RL-OL-8 > CF-2L
RL-OL-8 : PS-NS	3.152	238	19.669***	RL-OL-8 > PS-NS
RL-OL-8 : PS-OL	3.582	110	16.739***	RL-OL-8 > PS-OL
RL-OL-8 : PS-1L	2.592	239	13.241***	RL-OL-8 > PS-1L
RL-OL-8 : PS-2L	3.397	110	17.124***	RL-OL-8 > PS-2L
RL-OL-12 : CF-NS	0.016	241	0.082	RL-OL-12 = CF-NS
RL-OL-12 : CF-OL	0.128	101	0.650	RL-OL-12 = CF-OL
RL-OL-12 : CF-1L	0.861	236	4.146***	RL-OL-12 < CF-1L
RL-OL-12 : CF-2L	0.178	109	0.812	RL-OL-12 = CF-2L
RL-OL-12 : PS-NS	1.659	114	10.870***	RL-OL-12 > PS-NS
RL-OL-12 : PS-OL	2.115	242	16.168***	RL-OL-12 > PS-OL
RL-OL-12 : PS-1L	1.536	114	9.162***	RL-OL-12 > PS-1L
RL-OL-12 : PS-2L	1.942	241	14.881***	RL-OL-12 > PS-2L
CF-NS : CF-OL	0.278	225	1.167	CF-NS = CF-OL
CF-NS : CF-1L	0.666	104	2.939**	CF-NS < CF-1L
CF-NS : CF-2L	0.094	233	0.390	CF-NS = CF-2L
CF-NS : PS-NS	1.657	237	9.176***	CF-NS > PS-NS
CF-NS : PS-OL	2.135	110	9.110***	CF-NS > PS-OL
CF-NS : PS-1L	1.097	238	5.155***	CF-NS > PS-1L
CF-NS : PS-2L	1.841	109	8.360***	CF-NS > PS-2L

Table 6 (continued)

Comparison	$\bar{Y}_i - \bar{Y}_j$	df	t-ratio	Relationship
CF-OL : CF-1L	1.151	220	4.587***	CF-OL < CF-1L
CF-OL : CF-2L	0.342	96	1.731	CF-OL = CF-2L
CF-OL : PS-NS	1.342	100	5.672***	CF-OL > PS-NS
CF-OL : PS-OL	1.821	226	9.790***	CF-OL > PS-OL
CF-OL : PS-1L	0.908	99	3.450***	CF-OL > PS-1L
CF-OL : PS-2L	1.648	225	8.861***	CF-OL > PS-2L
CF-1L : CF-2L	0.783	228	3.095**	CF-1L > CF-2L
CF-1L : PS-NS	2.534	232	13.008***	CF-1L > PS-NS
CF-1L : PS-OL	2.908	105	10.978***	CF-1L > PS-OL
CF-1L : PS-1L	1.974	233	8.753***	CF-1L > PS-1L
CF-1L : PS-2L	2.743	103	10.730***	CF-1L > PS-2L
CF-2L : PS-NS	1.758	107	7.710***	CF-2L > PS-NS
CF-2L : PS-OL	2.193	234	11.464***	CF-2L > PS-OL
CF-2L : PS-1L	1.113	106	5.688***	CF-2L > PS-1L
CF-2L : PS-2L	2.020	233	10.562***	CF-2L > PS-2L
PS-NS : PS-OL	0.442	238	4.099***	PS-NS > PS-OL
PS-NS : PS-1L	0.594	110	3.398***	PS-NS < PS-1L
PS-NS : PS-2L	0.269	237	2.505*	PS-NS > PS-2L
PS-OL : PS-1L	1.002	239	6.424***	PS-OL < PS-1L
PS-OL : PS-2L	0.217	111	2.114*	PS-OL < PS-2L
PS-1L : PS-2L	0.829	238	5.320***	PS-1L > PS-2L

* P < .05; ** P < .01; *** P < .001

Table 7

Results of Analyses of Covariance: Effects of the Task Administration
and Subject Variables--Rote Learning Tasks

Source of Variation	RL-NS		RL-OL-4		RL-OL-8		RL-OL-12	
	df	Mean Square	df	Mean Square	df	Mean Square	df	Mean Square
Total	684	10.53	718	8.19	702	24.52	750	28.21
Model	034	156.46	034	149.84	034	432.91	034	515.03
Error	650	2.90	684	1.15	668	3.73	716	5.09
Mu	001	4.68	001	1.47	001	69.15	001	53.87
Sex	001	1.22	001	5.97*	001	8.74	001	51.59**
Presentation	001	115.67***	001	0.54	001	32.94***	001	1.32
Trials	005	125.16***	005	65.06***	005	241.64***	005	363.82***
Method	002	4.26	002	28.82***	002	51.15***	002	467.64***
Sex X Presentation	001	6.82	001	0.17	001	11.55	001	13.35
Sex X Method	002	7.29	002	6.91**	002	30.95***	002	64.60***
Presentation X Trials	005	3.18	005	0.30	005	1.15	005	2.73
Presentation X Method	002	9.93	002	1.42	002	83.16***	002	33.02**
Trials X Method	010	0.83	010	0.51	010	1.15	010	9.59
MA (linear)	001	0.03	001	47.54***	001	44.45**	001	17.07
CA (linear)	001	5.23	001	2.89	001	41.73*	001	46.39**
MA (quadratic)	001	4.97	001	23.10***	001	14.04	001	8.71
CA (quadratic)	001	3.65	001	5.47*	001	41.21	001	32.36*

* $P < .05$; ** $P < .01$; *** $P < .001$

Table 8

Least Squares Constants: Effects of Task Administration
and Subject Variables--Rote Learning Tasks

Variable	Variant	RL-NS ₁₂ Mu=2.4671	RL-OL-4 Mu=2.4738	RL-OL-8 Mu=4.1855	RL-OL-12 Mu=4.0619
Sex	S1	--	-0.0967	--	-0.2797
	S2	--	+0.0967	--	+0.2797
Presentation	P1	+0.4212	--	+0.2226	--
	P2	-0.4212	--	-0.2226	--
Method	M1	--	-0.4209	-0.4360	-1.5008
	M2	--	+0.1173	-0.0509	+0.0948
	M3	--	+0.3036	+0.4869	+1.4060
Presentation X Method	P1M1	-0.2462	--	+0.1190	+1.1417
	P1M2	+0.0842	--	-0.6771	-0.4106
	P1M3	+0.1620	--	+0.5581	+0.2689
	P2M1	+0.2462	--	-0.1190	-0.1417
	P2M3	-0.1620	--	+0.6771	+0.4106
	P2M3	-0.1620	--	-0.5581	+0.2689

Table 9

Results of the Kramer Multiple Range Tests: Effects of Task Administration
and Subject Variables--Rote Learning Tasks

Task	Variable	Comparison	Required Difference	$b_i - b_j$	Relationships
RL-NS	Presentation	P1:P2	(1 df: inspection)	0.8424	P1 < P2
RL-NS X Method	Presentation	P2M1:P1M3	0.1928	0.0842	P2M1 = P1M3
		P2M1:P1M2	0.0677	0.1620	P2M1 = P1M2
		P2M1:P2M2	0.3651	0.3304	P2M1 = P2M2
		P2M1:P2M3	0.3563	0.4082	P2M1 > P2M3
		P2M1:P1M1	0.4303	0.4924	P2M1 > P1M1
		P1M3:P1M2	0.3263	0.0778	P1M3 = P1M2
		P1M3:P2M2	0.1994	0.2462	P1M3 > P2M2
		P1M3:P2M3	0.4014	0.3240	P1M3 = P2M2
		P1M3:P1M1	0.3563	0.4082	P1M3 > P1M1
		P1M2:P2M2	0.3859	0.1684	P1M2 = P2M2
		P1M2:P2M3	0.1994	0.2462	P1M2 > P2M3
		P1M2:P1M1	0.3645	0.3304	P1M2 = P1M1
		P2M2:P2M3	0.3263	0.0778	P2M2 = P2M3

Table 1 (continued)

Task	Variable	Comparison	Required Difference	$b_i - b_j$	Relationship
		P2M2:P1M1	0.1971	0.1620	P2M2=P1M1
		P2M3:P1M1	0.1928	0.0842	P2M3=P1M1
RL-OL-4	Sex	S1:S2	(1 df: inspection)	0.1934	S2>S1
RL-OL-4	Method	M3:M2	0.2072	0.1863	M3=M2
		M3:M1	0.2184	0.7245	M3>M1
		M2:M1	0.2017	0.2082	M2>M1
RL-OL-8	Presentation	P1:P2	(1 df: inspection)	0.4452	P1>P2
RL-OL-8	Method	M3:M2	0.4210	1.3112	M3>M2
		M3:M1	0.4438	2.9068	M3>M1
		M2:M1	0.4227	1.5956	M2>M1
RL-OL-8	Presentation X Method	P2M2:P1M1	0.4299	0.2689	P2M2=P1M1
		P2M2:P1M3	0.2935	0.1417	P2M2=P1M3
		P2M2:P2M1	0.4427	0.5523	P2M2>P2M1
		P2M2:P2M3	0.4666	0.6795	P2M2>P2M3
		P2M2:P1M2	0.5185	0.8212	P2M2>P1M2
		P1M1:P1M3	0.4396	0.1272	P1M1=P1M3
		P1M1:P2M1	0.5075	0.2834	P1M1=P2M1
		P1M1:P2M3	0.2911	0.4106	P1M1>P2M3
		P1M1:P1M2	0.4530	0.5523	P1M1>P1M2
		P1M3:P2M1	0.2670	0.4106	P1M3>P2M1
		P1M3:P2M3	0.5752	0.5378	P1M3=P2M3
		P1M3:P1M2	0.4560	0.6795	P1M3>P1M2
		P2M1:P2M3	0.4396	0.1272	P2M1=P2M3
		P2M1:P2M2	0.2479	0.2689	P2M1>P1M2
		P2M3:P1M2	0.2784	0.1417	P2M3=P1M2
RL-OL-12	Sex	S1:S2	(1 df: inspection)	0.5594	S2>S1
RL-OL-12	Method	M3:M2	0.3543	0.5378	M3>M2
		M3:M1	0.3679	0.9229	M3>M1
		M2:M1	0.3217	0.3851	M2>M1

Table 9 (continued)

Task	Variable	Comparison	Required Difference	$b_i - b_j$	Relationship
RL-OL-12 Presentation X Method		P2M2:P1M3	0.2122	0.1190	P2M2=P1M3
		P2M2:P1M1	0.2140	0.5581	P2M2>P1M1
		P2M2:P2M1	0.4125	0.7961	P2M2>P2M1
		P2M2:P2M3	0.9277	1.2352	P2M2>P2M3
		P2M2:P1M2	0.4952	1.3542	P2M2>P1M2
		P1M3:P1M1	0.3535	0.4391	P1M3>P1M1
		P1M3:P2M1	0.2298	0.6771	P1M3>P2M1
		P1M3:P2M3	0.4026	1.1162	P1M3>P2M3
		P1M3:P1M2	0.4063	1.2352	P1M3>P1M2
		P1M1:P2M1	0.4235	0.2380	P1M1=P2M1
		P1M1:P2M3	0.2298	0.6771	P1M1>P2M3
		P1M1:P1M2	0.4125	0.7961	P1M1>P1M2
		P2M1:P2M3	0.3535	0.4391	P2M1>P2M3
		P2M1:P1M2	0.2140	0.5581	P2M1>P1M2
		P2M3:P1M2	0.2122	0.1190	P2M3=P1M2

Table 10

Results of Analyses of Covariance: Effects of the Task Administration
and Subject Variables--Concept Formation Tasks

Source of Variation	CF-NS		CF-OL		CF-1L		CF-2L	
	df	Mean Square	df	Mean Square	df	Mean Square	df	Mean Square
Total	696	16.92	654	14.17	660	21.56	696	17.81
Model	034	246.80	034	207.67	034	337.91	034	275.73
Error	662	5.11	620	3.56	626	4.37	662	4.57
Mu	001	55.18	001	50.90	001	91.31	001	26.54
Sex	001	0.67	001	47.10**	001	30.36**	001	25.88*
Presentation	001	11.12	001	1.33	001	42.64**	001	1.66
Trials	005	108.98***	005	47.86***	005	100.95***	005	110.79***
Method	002	522.49***	002	929.88***	002	259.03***	002	423.38***
Sex X Presentation	001	22.08*	001	25.46**	001	0.12	001	39.66**
Sex X Method	002	5.35	002	0.70	002	18.52*	002	11.33
Presentation X Trials	005	1.73	005	1.09	005	1.97	005	4.14
Presentation X Method	002	8.07	002	14.42*	002	25.12**	002	6.18
Trials X Method	010	4.68	010	8.55*	010	3.85	010	7.91
MA (linear)	001	51.93**	001	11.13	001	96.10***	001	1.54
CA (linear)	001	20.85*	001	89.59***	001	19.84*	001	22.24*
MA (quadratic)	001	13.71	001	45.47***	001	22.64*	001	86.32***
CA (quadratic)	001	25.69***	001	88.82***	001	19.67*	001	13.81

* P < .05; ** P < .01; *** P < .001

Table 11

Least Squares Constants: Effects of Task Administration
and Subject Variables--Concept Formation Tasks

Variable	Variant	CF-NS Mu=2.7624	CF-OL Mu=2.3846	CF-1L Mu=3.4425	CF-2L Mu=2.7846
Sex	S1	--	-0.2876	-0.2297	-0.2106
	S2	--	+0.2876	+0.2297	+0.2106
Presentation	P1	--	--	-0.2638	--
	P2	--	--	+0.2638	--
Method	M1	-0.6405	-1.0015	-0.5188	-0.8015
	M2	-1.0710	-1.4619	-0.7347	-0.7655
	M3	+1.7115	+2.4634	+1.2535	+1.5670
Presentation X Method	P1M1	--	-0.1443	-0.3408	--
	P1M2	--	-0.1649	+0.3945	--
	P1M3	--	+0.3092	-0.0537	--
	P2M1	--	+0.1443	+0.3408	--
	P2M2	--	+0.1649	-0.3945	--
	P2M3	--	-0.3092	+0.0537	--

Table 12

Results of the Kramer Multiple Range Tests: Effects of Task
Administration and Subject Variables--Concept Formation Tasks

Task	Variable	Comparison	Required Difference	$b_i - b_j$	Relationship
CF-NS	Method	M3:M1	0.4177	2.3520	M3>M1
		M3:M2	0.4345	2.7825	M3>M2
		M1:M2	0.4246	0.4305	M1>M2
CF-OL	Sex	S1:S2	(1 df inspection)	0.5752	S2>S1
CF-OLL	Method	M3:M1	0.3631	3.4649	M3>M1
		M3:M2	0.4035	3.9253	M3>M2
		M1:M2	0.3928	0.4604	M1>M2

Table 12 (continued)

Task	Variable	Comparison	Required Difference	$b_i - b_j$	Relationship
CF-OL	Presentation X Method	P1M3:P2M2	0.2127	0.1443	P1M3=P2M2
		P1M3:P2M1	0.2336	0.1649	P1M3=P2M1
		P1M3:P1M1	0.3959	0.4535	P1M3>P1M1
		P1M3:P1M2	0.4224	0.4741	P1M3>P1M2
		P1M3:P2M3	0.4838	0.6184	P1M3>P2M3
		P2M2:P2M1	0.3778	0.0206	P2M2>P1M1
		P2M2:P1M2	0.4832	0.3298	P2M2=P1M2
		P2M2:P2M3	0.4224	0.4741	P2M2>P3M3
		P2M1:P1M1	0.4238	0.2886	P2M1=P1M1
		P2M1:P1M2	0.2243	0.3092	P2M1>P1M2
		P2M1:P2M3	0.3959	0.4535	P2M1>P2M3
		P1M1:P1M2	0.3778	0.0206	P1M1=P1M2
		P1M1:P2M3	0.2336	0.1649	P1M1=P2M3
		P1M2:P2M3	0.2127	0.1443	P1M2=P2M3
CF-IL	Sex	S1:S2	(1 df inspection)	0.4594	S2>S1
CF-IL	Presentation	P1:P2	(1 df inspection)	0.5276	P2>P1
CF-IL	Method	M3:M1	0.4022	1.7723	M3>M1
		M3:M2	0.4187	1.9882	M3>M2
		M1:M2	0.4169	0.2159	M1=M2
CF-IL	Presentation X Method	P1M2:P2M1	0.2296	0.0537	P1M2=P2M1
		P1M2:P2M3	0.2555	0.3408	P1M2>P2M3
		P1M2:P1M3	0.4442	0.4482	P1M2>P1M3
		P1M2:P1M1	0.4780	0.7353	P1M2>P1M1
		P1M2:P2M2	0.5550	0.7890	P1M2>P2M2
		P2M1:P2M3	0.4041	0.2871	P2M1=P2M3
		P2M1:P1M3	0.2570	0.3945	P2M1>P1M3
		P2M1:P1M1	0.5285	0.6816	P2M1>P1M1
		P2M1:P2M2	0.4780	0.7353	P2M1>P2M2
		P2M3:P1M3	0.4598	0.1074	P2M3=P1M3
		P2M3:P1M1	0.2570	0.3945	P2M3=P1M1
		P2M3:P2M2	0.4442	0.4482	P2M3>P2M2
		P1M3:P1M1	0.4041	0.2871	P1M3=P1M1
		P1M3:P2M2	0.2555	0.5408	P1M3>P2M2
		P1M1:P2M2	0.2296	0.0537	P1M1=P2M2

Table 12 (continued)

Task	Variable	Comparison	Required Difference	$b_i - b_j$	Relationship
QF-2L	Sex	S1:S2	(1 df inspection)	0.4212	$S2 \geq S1$
QF-2L	Method	M3:M2	0.4033	2.3325	$M3 \geq M2$
		M3:M1	0.4161	2.3685	$M3 \geq M1$
		M2:M1	0.4238	0.0360	$M2 = M1$

Table 13

Results of Analyses of Covariance: Effects of the Task Administration
and Subject Variables--Problem Solving Tasks

Source of Variation	PS-NS		PS-OL		PS-1L		PS-2L	
	df	Mean Square	df	Mean Square	df	Mean Square	df	Mean Square
Total	720	4.03	684	2.16	732	9.20	690	2.50
Model	034	40.39	034	14.99	034	119.38	034	18.70
Error	686	2.23	650	1.49	698	3.83	656	1.66
Mu	001	3.09	001	1.49	001	0.46	001	1.42
Sex	001	3.74	001	4.95	001	1.22	001	12.11***
Presentation	001	1.89	001	0.69	001	4.47	001	0.37
Trials	005	21.54***	005	9.51**	005	50.47***	005	13.48***
Method	002	17.87***	002	7.20***	002	13.72*	002	11.29**
Sex X Presentation	001	19.48**	001	0.41	001	28.40**	001	9.95*
Sex X Method	002	6.55	002	14.80***	002	17.27*	002	2.84
Presentation X Trials	005	0.72	005	0.96	005	0.49	005	0.28
Presentation X Method	002	1.90	002	13.85***	002	20.02**	002	3.78
Trials X Method	010	2.37	010	0.40	010	0.58	010	1.33
MA (linear)	001	2.07	001	1.61	001	21.73*	001	16.60**
CA (linear)	001	2.58	001	3.58	001	3.90	001	0.91
MA (quadratic)	001	20.11**	001	5.17	001	94.89***	001	9.83*
CA (quadratic)	001	0.99	001	3.60	001	3.62	001	1.28

* $P < .05$; ** $P < .01$; *** $P < .001$

Table 14

Least Squares Constants: Effects of Task Administration
and Subject Variables--Problem Solving Tasks

Variable	Variant	PS-NS Mu=1.0501	PS-OL Mu=0.5955	PS-1L Mu=1.6822	PS-2L Mu=0.8018
Sex	S1	--	--	--	-0.1380
	S2	--	--	--	+0.1380
Presentation	P1	--	--	--	--
	P2	--	--	--	--
Method	M1	-0.3053	+0.1938	-0.1873	-0.0167
	M2	+0.2784	-0.1831	-0.0948	+0.2319
	M3	+0.0269	-0.0107	+0.2821	-0.2152
Method X Presentation	P1M1	+0.0608	+0.2791	-0.1726	--
	P1M2	-0.1022	-0.0596	+0.3321	--
	P1M3	+0.0414	-0.2195	-0.1595	--
	P2M1	-0.0608	-0.2791	+0.1726	--
	P2M2	+0.1022	+0.0596	-0.3321	--
	P2M3	-0.0414	+0.2195	+0.1595	--

Table 15

Results of the Kramer Multiple Range Tests: Effects of Task
Administration and Subject Variables--Problem Solving Tasks

Task	Variable	Comparison	Required Difference	$b_i - b_j$	Relationship
PS-NS	Method	M2:M3	0.2670	0.2515	M2=M3
		M2:M1	0.3008	0.5837	M2>M1
		M3:M1	0.2892	0.3322	M3>M1
PS-OL	Method	M1:M3	0.2341	0.2045	M1=M3
		M1:M2	0.2511	0.3769	M1>M2
		M3:M2	0.2255	0.1724	M3=M2

Table 15 (continued)

Task	Variable	Comparison	Required Difference	$b_i - b_j$	Relationship
PS-OL	Presentation X Method	P1M1:P2M3	0.1355	0.0596	P1M1=P2M3
		P1M1:P2M2	0.1372	0.2195	P1M1>P2M2
		P1M1:P1M2	0.2594	0.3387	P1M1>P1M2
		P1M1:P1M3	0.2552	0.4986	P1M1>P1M3
		P1M1:P2M1	0.3084	0.5582	P1M1>P2M1
		P2M3:P2M2	0.2285	0.1599	P2M3=P2M2
		P2M3:P1M2	0.1434	0.2791	P2M3>P1M2
		P2M3:P1M3	0.2836	0.8390	P2M3>P1M3
		P2M3:P2M1	0.2552	0.4986	P2M3>P2M1
		P2M2:P1M2	0.2709	0.1192	P2M2=P1M2
		P2M2:P1M3	0.1434	0.2791	P2M2>P1M3
		P2M2:P2M1	0.2594	0.3387	P2M2>P2M1
		P1M2:P1M3	0.2285	0.1599	P1M2=P1M3
		P1M2:P2M1	0.1372	0.2195	P1M2>P2M1
		P1M3:P2M1	0.1355	0.0596	P1M3=P2M1
PS-1L	Method	M3:M2	0.3471	0.3769	M3>M2
		M3:M1	0.3971	0.4694	M3>M1
		M2:M1	0.3717	0.0925	M2=M1
PS-1L	Presentation X Method	P1M2:P2M1	0.2111	0.1595	P1M2=P2M1
		P1M2:P2M3	0.2205	0.1726	P1M2=P2M3
		P1M2:P1M3	0.3869	0.4916	P1M2>P1M3
		P1M2:P1M1	0.3934	0.5047	P1M2>P1M1
		P1M2:P2M2	0.4577	0.6642	P1M2>P2M2
		P2M1:P2M3	0.3676	0.0131	P2M1=P2M3
		P2M1:P1M3	0.2126	0.3321	P2M1>P1M3
		P2M1:P1M1	0.4560	0.3452	P2M1=P1M1
		P2M1:P2M2	0.3934	0.5047	P2M2>P2M2
		P2M3:P1M3	0.4210	0.3190	P2M3=P1M3
		P2M3:P1M1	0.2126	0.3321	P2M3>P1M1
		P2M3:P2M2	0.3869	0.4916	P2M3>P2M2
		P1M3:P1M1	0.3676	0.0131	P1M3=P1M1
		P1M3:P2M2	0.2205	0.1726	P1M3=P2M2
		P1M1:P2M2	0.2111	0.1595	P1M1=P2M2
PS-2L	Sex	S1:S2	(1 df: inspection)	0.2760	S2>S1
PS-2L	Method	M2:M1	0.2468	0.2468	M2>M1
		M2:M3	0.2505	0.4471	M2>M3
		M1:M3	0.2402	0.1985	M1=M3

Table 16

Results of Analyses of Covariance: Effects of Intelligence Level
(MA and CA respectively held constant)

A. Mean Squares

Task	Source of Variation	Intelligence Level: MA nor CA=		Intelligence Level: MA=		Intelligence Level: CA=	
		df	MS _y	df	MS' _y	df	MS' _y
RL-NS	Between	2	15.10***	2	3.55	2	35.53***
	Within	114	2.81	113	2.14	113	2.14
RL-OL-4	Between	2	28.80**	2	2.40	2	62.27***
	Within	120	4.80	119	3.88	119	3.76
RL-OL-8	Between	2	41.25***	2	11.65*	2	76.29***
	Within	117	3.81	116	3.09	116	3.15
RL-OL-12	Between	2	22.40**	2	2.35	2	44.37***
	Within	121	2.79	120	2.24	120	2.18
CF-NS	Between	2	33.00**	2	0.05	2	42.41***
	Within	116	5.61	115	4.89	115	5.48
CF-OL	Between	2	22.15*	2	4.05	2	44.13***
	Within	105	6.53	104	5.79	104	5.97
CF-1L	Between	2	92.05***	2	3.95	2	143.25***
	Within	111	5.62	110	3.68	110	4.49
CF-2L	Between	2	59.20***	2	14.30*	2	112.93***
	Within	113	6.66	112	4.55	112	4.90

*p < .05; **p < .01; ***p < .001

Table 16 (continued)

Task	Source of Variation	Intelligence Level: MA nor CA=		Intelligence Level: MA=		Intelligence Level: CA=	
		df	MS _y	df	MS' _y	df	MS' _y
PS-NS	Between	2	4.80	2	2.25	2	12.45***
	Within	117	1.68	116	1.31	116	1.42
PS-OL	Between	2	2.15	2	0.05	2	2.91
	Within	117	1.05	116	1.00	116	1.04
PS-1L	Between	2	51.90***	2	1.60	2	80.61***
	Within	118	3.99	117	2.74	117	3.24
PS-2L	Between	2	1.50	2	0.70	2	3.91
	Within	116	1.02	115	0.95	115	0.97

* $P < .05$; $P < .01$; $P < .001$

B. Correlation Coefficients

Task	MA and Task Scores			CA and Task Scores		
	Total Group	Between Means	Within Groups	Total Group	Between Means	Within Groups
RL-NS	.54	.95	.49	.20	-.92	.42
RL-OL-4	.51	.99	.45	.31	-.83	.47
RL-OL-8	.53	.85	.44	.13	-.98	.42
RL-OL-12	.53	.95	.45	.30	-.80	.48

Table 16 (continued)

	MA and Task Scores			CA and Task Scores		
	Total Group	Between Means	Within Groups	Total Group	Between Means	Within Groups
CF-NS	.46	.99	.37	.02	-.76	.17
CF-OL	.41	.93	.35	.17	-.99	.31
CF-1L	.70	.98	.59	.19	.70	.46
CF-2L	.62	.92	.57	.34	-.79	.53
PS-NS	.49	.99	.47	.28	-.93	.40
PS-OL	.29	.99	.23	.25	-.87	.12
PS-1L	.66	.99	.57	.24	-.80	.44
PS-2L	.31	.93	.29	.14	-.92	.25

Table 17

Means of the Retarded, Normal, and Superior Subjects on the
Twelve Tasks: Means Unadjusted and Means Adjusted for CA
and Means Adjusted for MA^c

Task	Numbers of Subjects			Means: Unadjusted			Means: Adjusted for CA		
	R	N	S	R	N	S	R	N	S
RL-NS	27	47	46	1.64	2.44	3.01	0.97	2.70	3.42
RL-OL-4 ^a	32	43	48	3.91	4.54	5.58	3.23	4.81	5.98
RL-OL-8	26	50	44	2.70	4.35	4.92	2.03	4.62	5.33
RL-OL-12 ^b	32	45	47	2.04	2.44	3.46	1.49	2.63	3.81
CF-NS	25	51	43	1.77	2.38	3.65	1.38	2.53	3.89
CF-OL	24	39	41	1.35	2.71	2.90	0.84	2.87	3.25
CF-1L	23	47	44	2.34	2.70	5.18	1.37	3.01	5.84
CF-2L	30	43	43	1.74	2.33	4.01	0.79	2.65	4.64
PS-NS	32	43	45	0.66	1.01	1.37	0.34	1.11	1.59
PS-OL	23	51	46	0.47	1.25	2.74	0.04	1.45	3.05
PS-1L	31	44	46	0.47	1.25	2.74	0.04	1.45	3.05
PS-2L	27	51	41	0.53	0.78	0.95	0.30	0.87	1.09

^{a,b} Means presented here are based on scores transformed by factors of 2 and 2/3, respectively.

^c Means adjusted for MA in comparisons yielding F-ratios associated with $P < 0.05$ were the following: RL-OL 8: R, 3.5304; N, 4.5964; S, 3.8530; CF-2L: R, 3.3978, N 2.3515; S, 2.3476.

Table 18

Results of t -tests of Differences Between the Means of the Retarded, Normal, and Superior Subjects

A. Means Unadjusted

Task	Retarded:Normal			Retarded:Superior			Normal:Superior		
	$\bar{Y}_i - \bar{Y}_j$	$S_{Y_i - Y_j}^2$	Relation-ship	$\bar{Y}_i - \bar{Y}_j$	$S_{Y_i - Y_j}^2$	Relation-ship	$\bar{Y}_i - \bar{Y}_j$	$S_{Y_i - Y_j}^2$	Relation-ship
RL-NS	0.80	0.42	R=N	1.37**	0.42	R<S	0.57	0.35	N=S
RL-OL-4	0.63	0.51	R=N	1.66**	0.50	R<S	1.02*	0.46	N<S
RL-OL-8	1.65***	0.47	R<N	2.22***	0.48	R<S	0.57	0.40	N=S
RL-OL-12	0.38	0.39	R=N	1.40***	0.39	R<S	1.03**	0.35	N<S
CF-NS	0.61	0.57	R=N	1.88**	0.59	R<S	1.27*	0.49	N<S
CF-OL	0.63*	1.36	R<N	1.56*	2.52	R<S	0.20	0.57	N=S
CF-1L	0.36	0.60	R=N	2.84***	0.61	R<S	2.48***	0.50	N<S
CF-2L	0.60	0.60	R=N	2.29***	0.62	R<S	1.69**	0.56	N<S

Table 18 (continued)

Task	Retarded:Normal			Retarded:Superior			Normal:Superior		
	$\bar{Y}_i - \bar{Y}_j$	$S_{\bar{Y}_i - \bar{Y}_j}^2$	Relation-ship	$\bar{Y}_i - \bar{Y}_j$	$S_{\bar{Y}_i - \bar{Y}_j}^2$	Relation-ship	$\bar{Y}_i - \bar{Y}_j$	$S_{\bar{Y}_i - \bar{Y}_j}^2$	Relation-ship
PS-NS	0.35	0.30	R=N	0.71*	0.30	R<S	0.36	0.28	N=S
PS-OL	0.23	0.26	R=N	0.50	0.26	R=S	0.27	0.20	N=S
PS-1L	0.77	0.47	R=N	2.26***	0.47	R<S	1.49***	0.42	N<S
PS-2L	0.25	0.24	R=N	0.42	0.24	R=S	0.17	0.20	N=S

B. Means Adjusted for CA

Task	Retarded:Normal			Retarded:Superior			Normal:Superior		
	$\bar{Y}_i - \bar{Y}_j$	$S_{\bar{Y}_i - \bar{Y}_j}^2$	Relation-ship	$\bar{Y}_i - \bar{Y}_j$	$S_{\bar{Y}_i - \bar{Y}_j}^2$	Relation-ship	$\bar{Y}_i - \bar{Y}_j$	$S_{\bar{Y}_i - \bar{Y}_j}^2$	Relation-ship
RL-NS	1.72***	0.43	R<N	2.45***	0.44	R<S	0.72*	0.32	N<S
RL-OL-4	1.58**	0.48	R<N	2.75***	0.48	R<S	1.17**	0.41	N<S
RL-OL-8	2.59***	0.47	R<N	3.30***	0.49	R<S	0.71	0.37	N=S
RL-OL-12	1.14**	0.37	R<N	2.32***	0.37	R<S	1.18***	0.31	N<S

Table 18 (continued)

Task	Retarded:Normal			Retarded:Superior			Normal:Superior		
	$\bar{Y}_i - \bar{Y}_j$	$S_{\bar{Y}_i - \bar{Y}_j}$	Relation-ship	$\bar{Y}_i - \bar{Y}_j$	$S_{\bar{Y}_i - \bar{Y}_j}$	Relation-ship	$\bar{Y}_i - \bar{Y}_j$	$S_{\bar{Y}_i - \bar{Y}_j}$	Relation-ship
CF-NS	1.15	0.64	R=N	2.52***	0.68	R<S	1.36**	0.49	N<S
CF-OL	2.02**	0.64	R<N	2.41***	0.65	R<S	0.39	0.58	N=S
CF-1L	1.64**	0.59	R<N	4.47***	0.62	R<S	2.83***	0.45	N<S
CF-2L	1.86**	0.56	R<N	3.85***	0.58	R<S	1.99***	0.48	N<S
PS-NS	0.77*	0.29	R<N	1.25***	0.30	R<S	0.48	0.26	N=S
PS-1L	1.49**	0.44	R<N	3.19***	0.45	R<S	1.60***	0.38	N<S
PS-2L	0.58*	0.26	R<N	0.79**	0.28	R<S	0.21	0.21	N=S
C. Means Adjusted for MA									
Task	Retarded:Normal			Retarded:Superior			Normal:Superior		
	$\bar{Y}_i - \bar{Y}_j$	$S_{\bar{Y}_i - \bar{Y}_j}$	Relation-ship	$\bar{Y}_i - \bar{Y}_j$	$S_{\bar{Y}_i - \bar{Y}_j}$	Relation-ship	$\bar{Y}_i - \bar{Y}_j$	$S_{\bar{Y}_i - \bar{Y}_j}$	Relation-ship
RL-OL-8	1.07*	0.44	R<N	0.32	0.56	R=S	0.74	0.44	R=N
CF-2L	1.04	0.55	R=N	1.05	0.68	R=S	0.01	0.52	R=N

CHAPTER IV

RESULTS AND DISCUSSION

In brief, relationships reflected by statistical data in Chapter III seem to justify the following conclusions. Task complexity, task abstractness, task length, method of approach, and type of presentation in many cases affect, or interact to affect, learning. In the aggregate influence on verbal learning exerted by intelligence level, mental age, and chronological age, mental age has the dominant effect. Task materials variables interact with this effect to some extent. Sex, in interaction with task complexity level and task abstractness level, affects learning in some situations.

These conclusions are restricted explicitly to populations similar to those from which the subjects were selected, and to task materials variables, task administration variables, procedures, and response measures similar to those employed in the present investigation. Evidence for these conclusions is presented and discussed below.

The discussion is predicated heavily on several authors' conclusions about basic dynamics operating in the contribution by task, situational, and subject variables of which verbal learning is a function. These authors include Gagne (1964), Hovland (1951), H. H. Kendler (1964), T.S. Kendler (1961), Leeper (1951), Lipman (1963), McGeoch and Irion (1952), Melton (1964), Munn (1954), Osgood (1953), Rosenberg (1963), Russell (1956), Staats and Staats (1963), Travers (1963), Underwood (1949, 1964), Vinacke (1953), Welch (1947), and Woodworth and Schlosberg (1954). The presentation is organized in terms of the specific research objectives for the investigation.

Effects of Task Complexity

The basic question implicit in the research objective for task complexity is this: Does ease of learning vary as a function of the number of and relationships among the task components?

Results

With one exception, task complexity affected learning at all four task abstractness levels (Table 19).

1. Tasks involving nonsense syllables.
 - a. Responses to the rote learning tasks and the concept formation tasks were equivalent.
 - b. Responses to the rote learning and concept formation tasks, respectively, were more adequate than responses to the problem solving task.
2. Tasks involving words at the object level.
 - a. Responses to the eight-word rote learning task exceeded responses to the concept formation and problem solving tasks, respectively.
 - b. Responses to the concept formation tasks exceeded responses to the problem solving task.
3. Tasks involving words at the first and second levels of abstractness, respectively.
 - a. Responses to the concept formation task exceeded responses to the problem solving task.

Discussion

Generally, the task complexity was related to difficulty level: problem solving tasks were more difficult than concept formation tasks and rote learning tasks, and concept formation tasks were more difficult than rote learning tasks. The one exception to this relationship was on tasks involving nonsense syllables where the rote learning and concept formation tasks were similarly difficult.

The present investigator could locate no previous investigations of the effects of task complexity as the variable was defined herein. Issues pertinent to the nature and influence of task complexity have been discussed by such psychologists as Underwood (1949, 1964) and Gagne (1964).

Critical dimensions in producing the results appear to be the number of task components which the subjects had to manipulate and the degree to which an inferential process was required in dealing with the relationships among these task components. Complexity level was defined in terms of these dimensions and the tasks were designed to differ in these respects. Rote learning necessitated the association and integration of

Table 19

Effects of Task Complexity^a

Abstractness Level	Comparison	Tasks	Relationship
Nonsense Syllables	Rote Learning: Concept Formation	RL-NS: CF-NS	RL=CF
	Rote Learning: Problem Solving	RL-NS: PS-NS	RL>PS
	Concept Formation: Problem Solving	CF-NS: PS-NS	CF>PS
Object Level Words	Rote Learning: Concept Formation	RL-OL-8: CF-OL	RL>CF
	Rote Learning: Problem Solving	RL-OL-8: PS-OL	RL>PS
	Concept Formation: Problem Solving	CF-OL: PS-OL	CF>PS
First Level Words	Concept Formation: Problem Solving	CF-1L: PS-1L	CF>PS
Second Level Words	Concept Formation: Problem Solving	CF-2L: PS-2L	CF>PS

^aSource table: Table 6.

a finite number of specific stimulus and response units which were repeated from trial list to trial list. Concept formation required that the subject deal with different members of open-ended sets of stimuli. The subject had to discriminate similarities and differences among the given units of information and to generalize beyond "the immediately given situation and utilize memories and previously formed concepts (Woodworth and Schlosberg, 1954, p. 430)". Then, after he determined the grouping criterion being used, the subject had to apply this information in responding correctly to further specific stimuli. Problem solving encompassed the requirements of the concept formation situation; in addition, it required that the subject determine and apply a rule, or contingency relationship, among the several components of the task. Once he determined the rule, the subject had to use this information in responding correctly to subsequent specific stimuli.

In sum, the rote learning, concept formation, and problem solving tasks were designed to vary along a dimension of complexity as this dimension was described by Underwood (1949, p. 384): viz, the number of task components and the relationships among these task components. In view of the nature of the task requirements cited above, it was expected that "the dimension of complexity (might) be related loosely to difficulty of learning (Underwood, 1949, p. 384)". This expectation was confirmed by the data with but one exception. The expected relationship between the rote learning and concept formation tasks did not occur when nonsense syllables were employed as the task materials. The reason for this exception may rest in issues related to the effects of the task abstractness variable. These issues are considered below.

Effects of Task Abstractness Singly and Combined with Task Complexity

The research objectives for abstractness level reflect two concerns: Does abstractness level influence ease of learning? If so, is this influence consistent on tasks which differ in complexity level?

Results

Task Abstractness

Task abstractness affected learning (Table 20). The nature of this effect was influenced by task complexity.

Task Abstractness X Task Complexity

Task abstractness and task complexity interacted to affect learning (Table 21).

1. Rote learning tasks

- a. Learning on the rote learning task involving eight object level words exceeded that on the rote learning task involving nonsense syllables.

2. Concept formation tasks

- a. Learning on the concept formation task involving nonsense syllables was equivalent to that on the concept formation tasks involving words at the object level and words at the second level of abstractness. Learning on the task involving words at the first level of abstractness exceeded that on the task involving nonsense syllables.
- b. Learning on the concept formation task involving words at the first level exceeded that on the concept formation task involving words at the object level. Learning on the tasks involving words at the object level and second level, respectively, was equivalent.
- c. Learning on the concept formation task involving words at the first level of abstractness exceeded that on the concept formation task involving words at the second level of abstractness.

3. Problem solving tasks

- a. Learning on the problem solving task involving nonsense syllables exceeded that on the problem solving task involving object level words and words at the second level of abstractness. Learning on the problem solving task involving words at the first level of abstractness exceeded that on the problem solving task involving nonsense syllables.
- b. Learning on the problem solving tasks involving words at the first and second levels, respectively, exceeded that on the problem solving tasks involving object level words.
- c. Learning on the problem solving task involving words at the

Table 20

Effects of Task Abstractness^a

Complexity Level	Comparison	Tasks	Relationship
Rote Learning	Nonsense Syllables:	RL-NS:	NS<OL
	Object Level Words	RL-OL-8	
Concept Formation	Nonsense Syllables:	CF-NS:	NS=OL
	Object Level Words	CF-OL	
	Nonsense Syllables:	CF-NS:	NS<1L
	First Level Words	CF-1L	
	Nonsense Syllables:	CF-NS:	NS=2L
	Second Level Words	CF-2L	
Problem Solving	Object Level Words:	CF-OL :	OL<1L
	First Level Words	CF-1L	
	Object Level Words:	CF-OL :	OL=2L
	Second Level Words	CF-2L	
	First Level Words:	CF-1L :	1L>2L
	Second Level Words	CF-2L	
Problem Solving	Nonsense Syllables:	PS-NS:	NS>OL
	Object Level Words	PS-OL	
	Nonsense Syllables:	PS-NS:	NS<1L
	First Level Words	PS-1L	
	Nonsense Syllables:	PS-NS:	NS>2L
	Second Level Words	PS-2L	
Problem Solving	Object Level Words:	PS-OL:	OL<1L
	First Level Words	PS-1L	
	Object Level Words:	PS-OL:	OL<2L
	Second Level Words	PS-2L	
	First Level Words:	PS-1L:	1L>2L
	Second Level Words	PS-2L	

^aSource table: Table 6.

Table 21

Interaction Effects of Task Complexity and
Task Abstractness^a

Comparison	Complexity Level		
	Rote Learning	Concept Formation	Problem Solving
NS:OL	NS<OL	NS=OL	NS>OL
NS:1L	--	NS<1L	NS<1L
NS:2L	--	NS=2L	NS>2L
OL:1L	--	OL<1L	OL<1L
OL:2L	--	OL=2L	OL<2L
1L:2L	--	1L>2L	1L>2L

^aSource table: Table 6.

first level of abstractness exceeded that on the problem solving task involving words at the second level of abstractness.

Discussion

Generally, task abstractness influenced facility of learning. The nature of this influence was contingent upon task complexity. On the rote learning tasks, the subjects responded with more facility to object level words than to nonsense syllables. On the concept formation tasks, the task involving words at the first level of abstractness was easier than the tasks involving nonsense syllables, object level ~~words,~~ ^{words,} and words at the second level of abstractness. Concept formation tasks involving these latter types of materials were equally difficult. On the problem solving tasks, the hierarchical order from easier to more difficult was the following: words at the first level of abstractness, nonsense syllables, words at the second level of abstractness, and object level words.

These results are not inconsistent with research related to whether characteristics of the material similar to those examined herein affect task difficulty. This research includes the following: investigations by Guilford (1934), Lyon (1964), and McGeoch (1930) germane to the effect of meaningfulness or familiarity of material on ease of rote learning; investigations by Heidbreder¹, and by Long and Welch², on the effect of the abstractness or familiarity of the material on concept formation and problem solving; investigations by Bruner and others (1956) on the effects of number of defining attributes and positive and negative instances on concept formation.

For the purpose of this investigation, abstractness level was defined as degree of meaningfulness of the material in the sense of the inclusiveness of its conventional association value. Implicit here are two dimensions: meaningfulness or number of associations a stimulus elicits, and inclusiveness or closeness of the word-symbol to its concrete

¹Heidbreder (1946a, 1946b, 1947, 1948a, 1948b, 1948c, 1949a, 1949b).

²Long and Welch (1941, 1942); Welch (1940a, 1940b, 1940c, 1946, 1947a, 1947b); Welch and Long (1940, 1942, 1943).

referent with orders of abstractness being based on numbers of times successive new abstractions are made on the basis of additional defining characteristics.

Before the study was initiated this double dimension situation was recognized and accepted because it ~~paralleled~~^{paralleled} material learned in other areas of endeavor such as acquiring language. And so, the task materials were selected on the basis of the cited definitions. It was recognized that combination of the meaningfulness and inclusiveness definitions resulted in a curvilinear situation in terms of the component, degree of familiarity. As such, it was expected that the materials at object level and first level of abstractness would be associated with more adequate responses than nonsense syllables and materials at the second level of abstractness. To some extent, this expectation was confirmed. However, there was an interaction which involved the nature of the task. Critical factors appeared to be the kind of activity required to perform the task successfully in relation to difficulty inherent in task complexity or variations in the number of and relationships among the stimulus and response elements of the tasks.

In the rote learning situation, the relationship was straightforward: The task encompassing object level words was learned more easily than the task involving nonsense syllables. Probably operating here was, in McGeech's and Irion's (1952, pp. 471-472) terms, "a special case of transfer". That is, the subjects already were familiar with the object level words and what remained was for them to learn to use these words in a new context. On the other hand, when the task consisted of nonsense syllables, subjects had to become familiar with the nonsense syllables themselves and learn how to use them in a new situation. Thus, when they dealt with nonsense syllables, they simply had more to do than they did when they worked with object level words and this differential amount of work was reflected in relative facility in learning.

In the concept formation situation, this transfer effect of past experience with the material probably operated also. However, another factor possibly entered in. That is, the nonsense syllables and object level words were grouped on a classificatory basis whereas the words at the first and second levels of abstractness were grouped on a taxonomical basis.

When the materials were grouped on a taxonomical basis, the expected relationship occurred. Determining conceptual relationships among materials at the lower abstractness level was easier than determining concepts at the higher abstractness level. The dimension of inclusiveness probably operated here. That is, first level concepts had a more restricted number of defining attributes and specific instances and so less inferential activity or departure from the givens in the situation was involved. In dealing with second level concepts, the subjects had to encompass multiple defining characteristics and a wider variety of specific instances. Consequently, they had to employ more of the inferential activity and depart further from the givens in the situation.

When the materials were grouped on a classificatory basis, the expected relationships did not occur. That is, the subjects did not respond with more ease to the task involving object level words in contrast to the task involving nonsense syllables. This result cannot be attributed to lack of familiarity with the classificatory principle involved: grouping on the basis of the initial letter of the word. Such a classificatory principle is used daily in such activities as establishing alphabetical orders among materials. Also, such grouping is made on the basis of an extrinsic characteristic of the material. As a result, determining class relationships among units of the two sets of materials varying in meaningfulness did not require a differential use of the inferential process or going beyond the data. And so, although the materials differed in degree of meaningfulness, the same criterion for grouping could be used with both sets of materials with similar ease. The differential facilitative effect of positive transfer did not operate here as it did in rote learning. That is, the emphasis in concept formation was on using a familiar grouping process with both familiar and unfamiliar materials, whereas the emphasis in rote learning was on pairing digits and previously known words with pairing digits and nonsense syllables which could not have been known previously.

The equivalent difficulty of the tasks involving nonsense syllables, object level words, and second level words suggests that determining conceptual relationships among materials grouped on the basis of a classificatory criterion is as difficult as determining conceptual relationships among materials grouped on the basis of a taxonomical criterion at a high level of abstractness. These results may be a

function of the nature of the basis for grouping. The classificatory principle used herein was initial letter of words which symbolized concrete objects. Thus, grouped together were diverse concrete objects which had very little commonality in terms of their basic defining characteristics: e.g., picture and peach. On the other hand, the taxonomical principle involved species and genus relationships among concrete objects which, by definition, are similar on the basis of their common characteristics: e.g., apple and peach at the first level of abstractness or peach and bread at the second level of abstractness. Operating here are two types of relationships: extrinsic and intrinsic. Probably, since it is less artificial, grouping on the basis of an intrinsic relationship or taxonomical criterion is less difficult than grouping on an extrinsic relationship or classificatory criterion. This differential difficulty occurred when the taxonomical basis was the first level of abstractness and was cancelled only at the second level of abstractness when another dimension associated with difficulty, degree of inclusiveness, was operating.

These several factors influential in differential difficulty apparently operated even more markedly in the problem solving situation which involved other factors associated with difficulty: e.g., dealing with positive and negative instances of a concept as well as determining a rule on the basis of the joint agreement and differences reflected in the specific instances of different concepts.

Effects of Task Length

The research objective for task length pertained basically to whether children and adolescents learn various amounts of material with different degrees of facility.

Results

Task length affected learning on the three rote learning tasks composed of object level words (Table 22).

1. Learning on the four-word task exceeded learning on the eight-word task and the twelve-word task.
2. Learning on the eight-word task exceeded that on the twelve-word task.

Table 22
Effects of Task Length^{a,b}

Complexity and Abstractness Level	Comparison	Tasks	Relationship
Rote Learning Object Level	4 words: 8 words	RL-OL-4! RL-OL-8	4 words $\geq$ 8 words
	4 words: 12 words	RL-OL-4: RL-OL-12	4 words $\geq$ 12 words
	8 words: 12 words	RL-OL-8 RL-OL-12	8 words $>$ 12 words

^aSource Table: Table 6

^bNote: for the analyses referred to here the means for the RL-OL-4 and the RL-OL-12 tasks were based on scores transformed to an 8-unit scale by multiplying the scores by 2 and 2/3 respectively (Chapter II, Response Measure).

Discussion

Different amounts of material were learned with different degrees of ease; smaller amounts of material were less difficult to learn than larger amounts. The investigator located no previous investigation in which the task to be learned was the same as that used herein: paired associate rote learning of object level words and digits. Tangentially related investigations in which different material was used included the following early studies: nonsense syllables--Hovland (1940), Lyon (1914, 1917), and Robinson and Heron (1922); Peterson Rational Learning Problems--McGeoch and Overschelp (1930); Mazes--Scott and Henninger (1933) and Miles (1931). These investigators reported that tasks involving larger amounts of material were more difficult to learn. Thus, the results of the present study with pairs of object level words and digits were similar to those reported by investigators who used other materials.

The results possibly were influenced by two conditions. These

include relative amounts of work involved and differential intraserial inhibition.

Learning four, eight, and twelve units required progressively more work. Subjects learning the lesser amounts of material simply had less to do and could accomplish the required activity with more facility in a given amount of time. When other things like time and the nature of the material are held constant, shorter tasks are accomplished with greater facility in most areas of endeavor.

Intraserial inhibitory phenomena also may have operated to influence the results. Intraserial inhibition may occur in varying degrees in tasks involving differing numbers of units. As McGeoch and Irion (1952, p. 498) commented, "The addition of each item to a series increases the number of items which may exercise both a proactive and a retroactive influence." Either of these types of interference could result in increased task difficulty.

Effects of Method of Approach Singly and Combined with the Task Materials Variables

Essentially, the research objectives for method of approach pertained to two problems: What is the relative influence of the induction, demonstration, and deduction variants? Is this influence consistent on tasks differing in complexity level, abstractness level, and length?

Results

Method of Approach

Method of approach affected learning on all tasks except the RL-NS task (Table 23). The relative efficacy of the induction, demonstration, and deduction variants depended on the nature of the task.

Method of Approach X Task Complexity

When task abstractness was held constant, method of approach and task complexity interacted to affect learning (Table 24).

1. Tasks involving nonsense syllables

a. Induction and demonstration were equally effective

Table 23

Effects of Method of Approach a,b

Task	Relationship		
	M1:M2	M1:M3	M2:M3
RL-NS	M1=M2	M1=M3	M2=M3
RL-OL-4	M1<M2	M1<M3	M2=M3
RL-OL-8	M1<M2	M1<M3	M2<M3
RL-OL-12	M1<M2	M1<M3	M2<M3
CF-NS	M1>M2	M1<M3	M2<M3
CF-OL	M1>M2	M1<M3	M2<M3
CF-1L	M1=M2	M1<M3	M2<M3
CF-2L	M1=M2	M1<M3	M2<M3
PS-NS	M1<M2	M1<M3	M2=M3
PS-OL	M1>M2	M1=M3	M2=M3
PS-1L	M1=M2	M1<M3	M2<M3
PS-2L	M1<M2	M1=M3	M2>M3

^a Induction (M1); demonstration (M2); deduction (M3).

^b Source tables. Rote learning tasks: covariance analyses, Table 7; Kramer tests, Table 9. Concept formation tasks: covariance analyses, Table 10; Kramer tests, Table 12. Problem solving tasks: Covariance analyses, Table 13; Kramer tests, Table 15.

Table 24

Interaction Effects of Method of Approach and Task Complexity ^{a,b}

Abstractness Level	Complexity Level	Task	Relationship		
			M1:M2	M1:M3	M2=M3
Nonsense Syllables	Rote Learning	RL-NS	M1=M2	M1=M3	M2=M3
	Concept Formation	CF-NS	M1>M2	M1<M3	M2<M3
	Problem Solving	PS-NS	M1<M2	M1<M3	M2=M3
Object Level Words	Rote Learning	RL-OL-8	M1<M2	M1<M3	M2<M3
	Concept Formation	CF-OL	M1>M2	M1<M3	M2<M3
	Problem Solving	PS-OL	M1>M2	M1=M3	M2=M3
First Level Words	Concept Formation	CF-1L	M1=M2	M1<M3	M2<M3
	Problem Solving	PS-1L	M1=M2	M1<M3	M2<M3
Second Level Words	Concept Formation	CF-2L	M1=M2	M1<M3	M2<M3
	Problem Solving	PS-2L	M1<M2	M1=M3	M2>M3

^aInduction (M1); demonstration (M2); deduction (M3).^bSource tables. Rote learning tasks: covariance analyses, Table 7; Kramer tests, Table 9. Concept formation tasks: covariance analyses, Table 10; Kramer tests, Table 12. Problem solving tasks: covariance analyses, Table 13; Kramer tests, Table 15.

on the rote learning task. Induction was more effective on the concept formation task. Induction was less effective on the problem solving task.

- b. Induction and deduction were equally effective on the rote learning task. Induction was less effective on the concept formation and problem solving tasks.
 - c. Demonstration and deduction were equally effective on the rote learning and problem solving tasks. Demonstration was less effective on the concept formation task.
2. Tasks involving words at the object level
- a. Induction was less effective than demonstration on the rote learning task. Induction was more effective on the concept formation and problem solving tasks.
 - b. Induction was less effective than deduction on the rote learning and concept formation tasks. Induction and deduction were equally effective on the problem solving task.
 - c. Demonstration was less effective than deduction on the rote learning and concept formation tasks. Demonstration and deduction were equally effective on the problem solving task.
3. Tasks involving words at the first level of abstractness
- a. Induction and demonstration were equally effective on the concept formation and problem solving tasks.
 - b. Induction was less effective than deduction on the concept formation and problem solving tasks.
 - c. Demonstration was less effective than deduction on the concept formation and problem solving tasks.
4. Tasks involving words at the second level of abstractness
- a. Induction and demonstration were equally effective on the concept formation task. Induction was less effective on the problem solving task.
 - b. Induction was less effective than deduction on the concept formation task. Induction and deduction were equally effective on the problem solving task.
 - c. Demonstration was less effective than deduction on the concept formation task. Demonstration was more effective than deduction on the problem solving task.

Method of Approach X Task Abstractness

When task complexity was held constant, type of approach and task abstractness interacted to affect learning (Table 25). The nature of this interaction is described below.

1. Rote learning tasks

- a. Induction and demonstration were equally effective on the rote learning task involving nonsense syllables; induction was less effective on the task involving eight object level words.
- b. Induction and deduction were equally effective on the tasks involving nonsense syllables; induction was less effective on the task involving eight object level words.
- c. Demonstration and deduction were equally effective on the task involving nonsense syllables; demonstration was less effective on the task involving eight object level words.

2. Concept formation tasks

- a. Induction was more effective than demonstration on concept formation tasks involving nonsense syllables and object level words. Induction and demonstration were equally effective on tasks involving first and second level words.
- b. Induction was less effective than deduction on concept formation tasks at all four levels of abstractness.
- c. Demonstration was less effective than deduction on concept formation tasks at all four levels of abstractness.

3. Problem solving tasks

- a. Induction was less effective than demonstration on problem solving tasks involving nonsense syllables and second level words; induction was more effective on the task involving object level words. The two variants were equally effective on the task involving first level words.
- b. Induction was less effective than deduction on the problem solving tasks involving nonsense syllables and first level words. The two variants were equally effective on tasks involving object level words and second level words.
- c. Demonstration and deduction were equally effective on problem solving tasks involving nonsense syllables and object level words; demonstration was less effective on the task involving first level words; demonstration was more effective on the task involving second level words.

Table 25

Interaction Effects of Method of Approach and Task Abstractness^{a, b}

Complexity Level	Abstractness Level	Task	Relationship		
			M1:M2	M1:M3	M2:M3
Rote Learning	Nonsense Syllables	RL-NS	M1=M2	M1=M3	M2=M3
	Object Level Words	RL-OL-8	M1<M2	M1<M3	M2<M3
Concept Formation	Nonsense Syllables	CF-NS	M1>M2	M1<M3	M2<M3
	Object Level Words	CF-OL	M1>M2	M1<M3	M2<M3
	First Level Words	CF-1L	M1=M2	M1<M3	M2<M3
	Second Level Words	CF-2L	M1=M2	M1<M3	M2<M3
Problem Solving	Nonsense Syllables	PS-NS	M1<M2	M1<M3	M2=M3
	Object Level Words	PS-OL	M1>M2	M1=M3	M2=M3
	First Level Words	PS-1L	M1=M2	M1<M3	M2<M3
	Second Level Words	PS-2L	M1<M2	M1=M3	M2>M3

^aInduction (M1); demonstration (M2); deduction (M3).^bSource tables. Rote learning tasks: covariance analyses, Table 7; Kramer tests, Table 9. Concept formation tasks: covariance analyses, Table 10; Kramer tests, Table 12. Problem solving tasks: covariance analyses, Table 13; Kramer tests, Table 15.

Method of Approach X Task Length

Method of approach and task length did not interact to affect learning performance on the rote learning tasks (Table 26).

1. Induction was less effective than demonstration and deduction on rote learning tasks involving four, eight, and twelve words, respectively.
2. Demonstration and deduction were equally effective on the rote learning task involving four words; demonstration was less effective than deduction on the tasks involving eight and twelve words, respectively.

Discussion

The induction, demonstration, and deduction variants did influence learning differentially. The nature of this differential influence depended on task complexity and task abstractness but not on task length.

The present investigator could find no previous study of how verbal learning is influenced by induction, demonstration, and deduction variants similar to those employed herein. Tangentially related research includes the work of Katona (1940), Hendrickson and Schroder (1941), and Hilgard, and others (1953). Generally, these investigators all found that subjects responding on the basis of a principle were more effective in direct learning, retention, and transfer of learning than subjects responding in a trial and error or a rote fashion. Thus, results relevant to the type of approach variable yielded by the present study are consistent with those yielded by earlier studies of similar phenomena.

A critical condition operating in these results may be the amount and timing of information furnished the subjects (Osgood, 1953). Differential amounts and timing of information may have resulted in varying degrees of structure in the learning situation for subjects using the three methods.

Subjects who used the inductive approach made a response to each trial after the stimulus was presented the first time but before the stimulus was presented again with the correct response and reinforcement. This also was the case for subjects who used the deductive approach; however, before the first series of trials and after each test list

Table 26

Interaction Effects of Method of Approach and Task Length^{a,b}

Complexity and Abstractness Level	Length	Task	Relationship		
			M1:M2	M1:M3	M2:M3
Rote Learning Object Level	4 words	RL-OL-4	M1<M2	M1<M3	M2=M3
	8 words	RL-OL-8	M1<M2	M1<M3	M2<M3
	12 words	RL-OL-12	M1<M2	M1<M3	M2<M3

^aInduction (M1); demonstration (M2); deduction (M3).^bSource tables: covariance analyses, Table 7; Kramer tests, Table 9.

(i.e., before each subsequent series of trials), they were presented a complete list of the several word-digit pairs in rote learning, the several concepts and the correct response digits in concept formation, and the rule or principle or relationship in problem-solving. For subjects who used the demonstration approach, the reverse of the procedure for the inductive approach was used; *viz*, the stimulus was presented with the correct response or reinforcement, then the stimulus was presented again and the subjects responded.

Subjects using the deduction approach only had to apply the given information to specific instances during training and receive reinforcement. Subjects using the demonstration approach were given correct responses to specific instances and they had to determine the specific word digit pairs in rote learning, the concepts in concept formation, and the rule in problem solving; then, when the correct specific instances were given to them they could observe how the several models were applied to specific instances in subsequent training trials. Subjects using the induction approach had to determine correct responses to specific instances, and they had to determine the specific word-digit pairs, the concepts, and the rule; then, they had to apply these to subsequent specific instances. Thus, subjects using the three methods

had access to different amounts of information given at different times in the sequence of activities and this differential information, in turn, may have resulted in a different amount of structure in the learning situation. Amount of structure usually is associated positively with facility in learning.

The induction method as it was employed herein corresponds to what is termed, pedagogically, the discovery method. Some educators commend the use of this method. The rationale for this commendation seems to be that when pupils are given generalizations before they deal with specific instances they tend to learn these generalizations as verbalisms and frequently are unable to apply them to specific instances. This problem of comprehension and application may occur in many learning situations, especially situations involving new material being presented over a period of time. However, this problem may not apply to situations similar to that used in the present study. Here, in all cases except those involving nonsense syllables, the subjects were dealing with new applications of already learned material. Further, making correct responses necessitated applying the principle to specific instances immediately. As a result, the subjects did not have the opportunity to form verbalisms independent of specific applications. Further investigations are needed to explore the effects of the approach variants in more extensive ranges of learning situations. In this research, specific attention should be given to varying the amount of subjects' previous knowledge of the task components to be used in a new learning situation and to varying the amounts of time between acquisition and application of the generalization.

Effects of Type of Presentation Singly and Combined with Method of Approach and the Task Materials Variables

Research objectives for the type of presentation variant involved examining the ~~relative~~ ^{relative} influence of the oral-visual and oral presentations singly and in combination with the method of approach, task complexity, task abstractness, and task length variables.

Results

Type of Presentation

Type of presentation singly affected learning only on the RL-NS, RL-OL-8, and CF-1L tasks (Table 27). On the RL-NS and RL-OL-8 tasks, oral-visual presentation was more effective. On the CF-1L task, oral presentation was more effective.

Task 27

Effects of Type of Presentation^{a,b}

Task	Relationship	Task	Relationship	Task	Relationship
RL-NS	P1>P2	CF-NS	P1=P2	PS-NS	P1=P2
RL-OL-4	P1=P2	CF-OL	P1=P2	PS-OL	P1=P2
RL-OL-8	P1>P2	CF-1L	P1<P2	PS-1L	P1=P2
RL-OL-12	P1=P2	CF-2L	P1=P2	PS-2L	P1=P2

^aOral-visual (P1); oral (P2).

^bSource tables. Rote learning tasks: covariance analyses, Table 7; Kramer tests, Table 9. Concept formation tasks: covariance analyses, Table 10; Kramer tests, Table 12. Problem solving tasks: covariance analyses, Table 13; Kramer tests, Table 15.

Type of Presentation X Method of Approach

Type of presentation and method of approach interacted to affect learning on seven tasks (Table 28). These tasks were RL-NS, RL-OL-8, RL-OL-12, CF-OL, PS-OL, and PS-1L.

1. RL-NS. With induction, oral presentation was more effective. With demonstration and deduction, oral-visual presentation and oral presentation were equally effective.
2. RL-OL-8. With induction, oral-visual presentation and oral presentation were equally effective. With demonstration, oral presentation was more effective. With deduction, oral-visual

Table 28

Interaction Effects of Type of Presentation
and Method of Approach^{a, b}

Task	Relationship		
	M1(P1:P2)	M2(P1:P2)	M3(P1:P2)
RL-NS	M1(P1<P2)	M2(P1=P2)	M3(P1=P2)
RL-OL-4	M1(P1=P2)	M2(P1=P2)	M3(P1=P2)
RL-OL-8	M1(P1=P2)	M2(P1<P2)	M3(P1>P2)
RL-OL-12	M1(P1=P2)	M2(P1<P2)	M3(P1=P2)
CF-NS	M1(P1=P2)	M2(P1=P2)	M3(P1=P2)
CF-OL	M1(P1=P2)	M2(P1=P2)	M3(P1>P2)
CF-1L	M1(P1<P2)	M2(P1>P2)	M3(P1=P2)
CF-2L	M1(P1=P2)	M2(P1=P2)	M3(P1=P2)
PS-NS	M1(P1=P2)	M2(P1=P2)	M3(P1=P2)
PS-OL	M1(P1>P2)	M2(P1=P2)	M3(P1<P2)
PS-1L	M1(P1=P2)	M2(P1>P2)	M3(P1=P2)
PS-2L	M1(P1=P2)	M2(P1=P2)	M3(P1=P2)

^a Method of Approach: induction (M1); demonstration (M2); induction (M3). Type of Presentation: oral-visual (P1); oral (P2).

^b Source tables: Rote learning tasks: covariance analyses, Table 7; Kramer tests, Table 9. Concept formation tasks: covariance analyses, Table 10; Kramer tests, Table 12. Problem solving tasks: covariance analyses, Table 13; Kramer tests, Table 15.

presentation was more effective.

3. RL-OL-12. With induction and deduction, oral-visual presentation and oral presentation were equally effective. With demonstration, oral-visual presentation was less effective.
4. CF-OL. With induction and demonstration, oral-visual presentation and oral presentation were equally effective. With deduction, oral-visual presentation was more effective.
5. CF-1L. With induction, oral-visual presentation was less effective. With demonstration, oral-visual presentation was more effective. With deduction, oral-visual presentation and oral presentation were equally effective.
6. PS-OL. With induction, oral-visual presentation was more effective. With demonstration, oral-visual presentation and oral presentation were equally effective. With deduction, oral-visual presentation was less effective.
7. PS-1L. With induction and deduction, oral-visual presentation and oral presentation were equally effective. With demonstration, oral-visual presentation was more effective.

Type of Presentation X task Complexity

When task abstractness was held constant, type of presentation and task complexity tended to interact to affect learning (Table 29).

1. Tasks involving nonsense syllables
Oral-visual presentation was more effective on the rote learning task. Oral-visual presentation and oral presentation were equally effective on the concept formation and problem solving tasks.
2. Tasks involving words at the object level
Oral-visual presentation was more effective on the eight-word rote learning task. Oral-visual presentation and oral presentation were equally effective on the concept formation and problem solving tasks.
3. Tasks involving words at the first level of abstractness
Oral-visual presentation was less effective on the concept formation task. Oral-visual presentation and oral presentation were equally effective on the problem-solving task.
4. Tasks involving words at the second level of abstractness
Oral-visual presentation and oral presentation were equally effective on the concept formation and problem-solving tasks.

Table 29

Interaction Effects of Type of Presentation
and Task Complexity^{a, b}

Abstractness Level	Complexity Level	Task	Relationship P1:P2
Nonsense Syllables	Rote Learning	RL-NS	P1>P2
	Concept Formation	CF-NS	P1=P2
	Problem Solving	PS-NS	P1=P2
Object Level Words	Rote Learning	RL-OL-8	P1>P2
	Concept Formation	CF-OL	P1=P2
	Problem Solving	PS-OL	P1=P2
First Level Words	Concept Formation	CF-1L	P1<P2
	Problem Solving	PS-1L	P1=P2
Second Level Words	Concept Formation	CF-2L	P1=P2
	Problem Solving	PS-2L	P1=P2

^aOral-visual (P1); oral, (P2).

^bSource tables. Rote learning tasks: Covariance analyses, Table 7; Kramer tests, Table 9. Concept formation tasks: covariance analyses, Table 10; Kramer tests, Table 12. Problem solving tasks: covariance analyses, Table 13; Kramer tests, Table 15.

Type of Presentation X Task Abstractness

When task complexity was held constant, type of presentation and task abstractness tended to interact to affect performance in only one situation (Table 30).

1. Rote learning tasks

Oral-visual presentation was more effective on the rote learning tasks involving nonsense syllables and eight object level words, respectively.

2. Concept formation tasks

Oral-visual presentation was less effective on the concept formation task consisting of words at the first level of abstractness. In the other concept formation tasks, oral-visual and oral presentation were equally effective.

3. Problem solving tasks

Oral-visual presentation and oral presentation were equally effective at the four levels of abstractness.

Type of Presentation X Task Length

Type of presentation and task length interacted, to some extent, to affect learning on the rote-learning tasks (Table 31).

1. Oral-visual presentation was more effective on the rote-learning task involving eight object level words.
2. Oral-visual presentation and oral presentation were equally effective on the tasks involving four and twelve words, respectively.

Discussion

Type of presentation influenced learning in only a few situations and interacted only slightly with complexity level, abstractness level, and task length to affect learning. It interacted more frequently with method of approach.

Type of presentation has not been studied extensively in recent years. Earlier investigators include Henmon (1912), Koch (1930) and Smedley (1902) who found oral-visual presentation to be more effective, in some

Table 30

Interaction Effects of Type of Presentation
and Task Abstractness^{a,b}

Complexity Level	Abstractness Level	Task	Relationship P1:P2
Rote Learning	Nonsense Syllables	RL-NS	P1>P2
	Object Level Words	RL-OL	P1>P2
Concept Formation	Nonsense Syllables	CF-NS	P1=P2
	Object Level Words	CF-OL	P1=P2
	First Level Words	CF-1L	P1<P2
	Second Level Words	CF-2L	P1=P2
Problem Solving	Nonsense Syllables	PS-NS	P1=P2
	Object Level Words	BS-OL	P1=P2
	First Level Words	PS-1L	P1=P2
	Second Level Words	PS-2L	P1=P2

^aOral-visual (P1); oral (P2).

^bSource tables. Rote learning tasks: covariance analyses, Table 7; Kramer tests, Table 9. Concept formation tasks: covariance analyses, Table 10; Kramer tests, Table 12. Problem solving tasks: covariance analyses, Table 13; Kramer tests, Table 15.

Table 31

Interaction Effects of Type of Presentation and Task Length^{a,b}

Complexity and Abstractness Level	Length	Task	Relationship P1:P2
Rote Learning Object Level	4 words	RL-OL-4	P1=P2
	8 words	RL-OL-8	P1>P2
	12 words	RL-OL-12	P1=P2

^aOral-visual (P1); oral (P2).^bSource tables: covariance analyses, Table 7; Kramer tests, Table 9.

cases, than oral or visual presentation in learning verbal materials. Generally, the results of the present study are not inconsistent with the results of the earlier studies.

Two conditions may have operated in producing the rather equivocal results obtained in both the present study and the previous studies. These pertain to degree of attention involved (McGeoch and Irion, 1952) and control of exposure time (Schulz, 1964).

In the present study, when he received the oral-visual presentation, the subject listened to the administrator giving the stimulus orally and he looked at the stimulus printed on his task booklet. When he received the oral presentation, the subject listened to the administrator giving the stimulus orally but he had no stimulus printed on his task booklet.

In the oral presentation, attention could be focussed on only a very small unit at one time. Conversely, in the oral-visual presentation, stimulation from two modalities was present; consequently, attention could be focussed on a larger unit and this might have been advantageous

in learning. However, on the negative side, in the oral-visual presentation, stimulation in one modality could be a distraction to perception of stimulation through another modality and this might have interfered with learning.

It is possible that timing of stimulus presentation might be influential. In the present study, timing was not controlled rigidly. Instead, an attempt was made to simulate a classroom presentation situation. It may be that exposure time for the two variants differed from trial to trial. To the extent that small variations in exposure time could affect results, it may have happened that possible differences in exposure time during the trials resulted in cancelling out the relative effects of the two presentation variants. Another important aspect of timing is simultaneity of the auditory and visual stimulation in the oral-visual presentation. Possibly, non-simultaneous presentation of the two types of stimuli could have occurred. These, in turn, may have served to distract the subjects and these distractions may have been inimical to learning. The way variations in timing influence relative effectiveness of oral, visual, and oral-visual types of presentation would bear systematic scrutiny in further research.

Effects of Intelligence Level (MA and CA Respectively Held Constant)
Singly and Combined with the Task Materials Variables

When school age subjects are selected, MA, CA, and IQ, by definition, are not independent of one another. Examining the influence of any one of these variables on learning is facilitated by concomitant consideration of the other two. Consequently, the research objectives for these three variables pertain to these basic issues: the relationship between intelligence level and learning a variety of verbal materials; the role in this relationship of MA and CA each singly and in combination with task complexity, task abstractness, and task length.

Results

When neither CA nor MA was held constant, comparisons of the learning of retarded, normal, and superior subjects yielded significant F-ratios in all except three analyses: PS-NS, PS-OL, and PS-2L (Tables 16A, 18A).

The correlations between means for MA and task scores were high and positive. These measures for the groups combined and within the groups respectively, were moderately correlated. High negative correlations were present between the means for CA and task scores. Rather low, positive correlations were present between the CA's and task scores for the groups combined and within the groups (Table 10B).

Intelligence Level (MA=, CA#)

When the effect of MA was removed statistically and CA remained to vary, the retarded, normal, and superior subjects generally did not differ in terms of mean task scores (Table 32). Since null relationships were the rule, it follows that there was no interaction with task complexity, task abstractness, nor task length.

Intelligence Level (CA =, MA #)

When the effect of CA was removed statistically and MA remained to vary, the F-ratios were significant on all tasks except PS-OL (Table 33). The relationships among the groups were influenced, to some extent, by the task characteristics.

Intelligence Level (CA =, MA #) X Task Complexity

When abstractness was held constant, complexity and intelligence level (CA =, MA#) tended to interact to affect learning (Table 34).

1. Tasks involving nonsense syllables

- a. The retarded subjects responded less adequately than the normal subjects on the rote learning and problem solving tasks; the groups were equivalent on the concept formation task.
- b. Retarded subjects responded less adequately than superior subjects on the rote learning, concept formation, and problem solving tasks.
- c. Normal subjects responded less adequately than superior subjects on the rote learning and concept formation tasks; the groups were equivalent on the problem solving task.

2. Tasks involving words at the object level.

- a. Retarded subjects responded less adequately than normal and superior subjects on the eight-word rote learning task and the concept formation task. The three groups did not differ on the problem solving task.
- b. Normal and superior subjects responded in a similar manner

Table 32

Effects of Intelligence Level (Mental Age Held Constant,
Chronological Age Varied)^{a,b}

Task	R:N	Relationship	
		R:S	N:S
RL-NS	R=N	R=S	N=S
RL-OL-4	R=N	R=S	N=S
RL-OL-8	R=N	R=S	N=S
RL-OL-12	R=N	R=S	N=S
CF-NS	R=N	R=S	N=S
CF-OL	R=N	R=S	N=S
CF-1L	R=N	R=S	N=S
CF-2L	R=N	R=S	N=S
PS-NS	R=N	R=S	N=S
PS-OL	R=N	R=S	N=S
PS-1L	R=N	R=S	N=S
PS-2L	R=N	R=S	N=S

^a Intellectually retarded (R), normal (N), superior (S).

^b Source tables: analyses of covariance, Table 16; t-tests, Table 18.

Table 33

Effects of Intelligence Level (Chronological Age Held Constant,
Mental Age Varied) ^{a,b}

Task	R:N	Relationship R:S	N:S
RL-NS	R<N	R<S	N<S
RL-OL-4	R<N	R<S	N<S
RL-OL-8	R<N	R<S	N=S
RL-OL-12	R<N	R<S	N<S
CF-NS	R=N	R<S	N<S
CF-OL	R<N	R<S	N=S
CF-1L	R<N	R<S	N<S
CF-2L	R<N	R<S	N<S
PS-NS	R<N	R<S	N=S
PS-OL	R=N	R=S	N=S
PS-1L	R<N	R<S	N<S
PS-2L	R<N	R<S	N=S

^aIntellectually retarded (R), normal, (N), superior (S).

^bSource tables: analyses of covariance, Table 16; t-tests, Table 18.

Table 34

Interaction Effects of Task Complexity and of
Intelligence Level (Chronological Age Held
Constant, Mental Age Varied)^{a, b}

Abstractness Level	Complexity Level	Task	Relationship		
			R:N	R:S	N:S
Nonsense Syllables	Rote Learning	RL-NS	R<N	R<S	N<S
	Concept Formation	CF-NS	R=N	R<S	N<S
	Problem Solving	PS-NS	R<N	R<S	N=S
Object Level Words	Rote Learning	RL-OL-8	R<N	R<S	N=S
	Concept Formation	CF-OL	R<N	R<S	N=S
	Problem Solving	PS-OL	R=N	R=S	N=S
First Level Words	Concept Formation	CF- ~~2L~~ 1L	R<N	R<S	N<S
	Problem Solving	PS- ~~2L~~ 1L	R<N	R<S	N<S
Second Level Words	Concept Formation	CF-2L	R<N	R<S	N<S
	Problem Solving	PS-2L	R<N	R<S	N=S

^a Intellectually retarded (R), normal (N), superior (S).

^b Source table: Analyses of covariance, Table 16; t-tests, Table 18.

on the eight-word rote learning task and the concept formation, and problem solving tasks.

3. Tasks involving words at the first level of abstractness.
 - a. On the concept formation and problem solving tasks, retarded subjects responded less adequately than normal and superior subjects.
 - b. Normal subjects responded less adequately than superior subjects on these two tasks.
4. Tasks involving words at the second level of abstractness.
 - a. Retarded subjects responded less adequately than normal and superior subjects on the concept formation and problem solving tasks.
 - b. Normal subjects responded less adequately than superior subjects on the concept formation task; the groups responded with similar adequacy on the problem solving task.

Intelligence Level (CA=, MA#) X Task Abstractness

When task complexity was held constant, task abstractness and intelligence level (CA=MA#) tended to interact to affect learning (Table 35).

1. Rote Learning Tasks
 - a. On the rote learning tasks involving nonsense syllables and eight object level words, retarded subjects responded less adequately than normal and superior subjects.
 - b. On the rote learning task involving nonsense syllables, normal subjects responded less adequately than superior subjects. The two groups responded similarly on the rote learning task involving eight object level words.
2. Concept formation tasks
 - a. Retarded subjects responded less adequately than normal subjects on the concept formation tasks involving object level words, first level words, and second level words; the two groups responded similarly on the concept formation task involving nonsense syllables.
 - b. Retarded subjects responded less adequately than superior subjects on the concept formation tasks at all four abstractness levels.
 - c. Normal subjects responded less adequately than superior subjects on the concept formation tasks involving all

Table 35

Interaction Effects of Task Abstractness and Intelligence Level (Chronological Age Held Constant Mental Age Varied)^{a,b}

Complexity Level	Abstractness Level	Task	Relationship		
			R:N	R:S	N:S
Rote Learning	Nonsense Syllables	RL-NS	R<N	R<S	N<S
	Object Level Words	RL-OL-8	R<N	R<S	N=S
Concept Formation	Nonsense Syllables	CF-NS	R=N	R<S	N<S
	Object Level Words	CF-OL	R<N	R<S	N=S
	First Level Words	CF-1L	R<N	R<S	N<S
	Second Level Words	CF-2L	R<N	R<S	N<S
Problem Solving	Nonsense Syllables	PS-NS	R<N	R<S	N=S
	Object Level Words	PS-OL	R=N	R=S	N=S
	First Level Words	PS-1L	R<N	R<S	N<S
	Second Level Words	PS-2L	R<N	R<S	N<S

^aIntellectually retarded (R), Normal (N); superior (S).

^bSource table: Analyses of covariance, Table 16; t-tests, Table 18.

levels of abstractness except object level words; here, the groups were equivalent.

3. Problem solving tasks

- a. Except for the problem solving task involving object level words, retarded subjects responded less adequately than normal and superior subjects. On the problem solving task involving object level words, retarded, normal, and superior subjects responded similarly.
- b. Normal and superior subjects did not differ on the problem solving tasks involving nonsense syllables and object level words. Normal subjects responded less adequately than superior subjects on tasks involving first and second level words.

Intelligence Level (CA =, MA^a) X Task Length

On rote learning tasks composed of object level words, task length did not interact to any great extent with intelligence level when CA was held constant and MA was varied (Table 36).

Table 36

Interaction Effects of Task Length and Intelligence
Level (Chronological Age Held Constant, Mental Age Varied)^{a,b}

Abstractness and Complexity Level	Length	Task	Relationship		
			R:N	R:S	N:S
Rote Learning Object Level Words	4 words	RL-OL-4	R<N	R<S	N<S
	8 words	RL-OL-8	R<N	R<S	N=S
	12 words	RL-OL-12	R<N	R<S	N<S

^aFor the analyses referred to here, the scores on the RL-OL-4 and RL-OL-8 tasks were transformed to an 8-unit scale by multiplying the scores by 2 and 2/3, respectively (Chapter II, Response Measures)

^bSource tables: analyses of covariance, Table 16; t-tests, Table 18.

1. Retarded subjects responded less adequately than normal and superior subjects on tasks involving four, eight, and twelve object level words.
2. Normal subjects responded less adequately than superior subjects on the four-word and twelve-word tasks, respectively. The groups did not differ on the eight-word task.

Discussion

Generally, intelligence was related to learning: in most cases, retarded, normal, and superior subjects differed in attainment; the more intelligent subjects responded more adequately. MA was the major contributing variable. When MA was held constant and CA was allowed to vary, differences among the groups disappeared. When CA was held constant, differences were magnified. This latter result was mediated, partially, by the presence of some interaction between MA and CA. That is, MA and CA were negatively related to some extent; retarded subjects' CA's exceeded normal and superior subjects' CA's while normal and superior subjects had equivalent CA's; on the other hand, the superior subjects' MA's exceeded those of normal and retarded subjects and the normal subjects' MA's exceeded those of retarded subjects. Also, a negative correlation was present between the means for CA and the task scores. When this attenuating influence was neutralized by removing the effect of CA, differences between the task means of the retarded, normal, and superior subjects increased. To some extent, MA and both task complexity and task abstractness interacted to affect learning.

Related research includes investigations which involved the following combinations of components: (1) comparisons of retarded and normal subjects or retarded, normal and superior subjects; (2) control of MA or CA; (3) rote learning, concept formation, or problem solving tasks composed of verbal materials. Eliminated from consideration here are similar comparisons of these subjects on tasks involving the following: conditioning; discrimination learning; processes like creativity; academic achievement; and rote learning, concept formation, and problem solving tasks involving non-verbal materials.

Among investigators who held CA constant and allowed MA to vary were Barnett, Ellis, and Pryer (1960), Blake (1961), Berkson and Cantor (1960), Ellis and others (1960), Pryer (1960), Whiteside (1934), and Wilson (1928).

These investigators reported that subjects who had lower intelligence performed less adequately than subjects who had higher intelligence. With several exceptions, the results of the present study were consistent with the results of these previous studies.

Investigators who held MA constant and allowed CA to vary were Blake (1959, 1961), Johnson and Blake (1960), Martin and Blum (1961), Osborn (1960), and Wilson (1928). Results of these studies are inconsistent. In some situations, retarded and normal subjects were homogeneous in learning: *viz.*, Johnson and Blake (1960), serial rote learning of nonsense syllables pairs; Blake (1961), paired associate rote learning of nonsense syllable--digit pairs; Martin and Blum (1961) and Osborn (1960), concept formation involving pictured objects. In other cases, retarded subjects performed less adequately: *viz.*, Blake (1959), paired associate rote learning of nonsense syllable-digit pairs; Johnson and Blake (1960), paired associate rote learning of nonsense syllable pairs; Wilson (1928), paired associate rote learning of shorthand characters; Blake (1959) concept formation involving object level words and digits. Results of comparisons of retarded and superior subjects and of normal and superior subjects who were similar in terms of MA (Blake, 1959); Blake 1961) indicated the following: normal and superior subjects responded equivalently on tasks requiring rote learning of nonsense syllable-digit pairs and on tasks requiring determining concepts involving object level words and digits; retarded subjects responded less adequately than superior subjects on these tasks.

Results of the present study are consistent with results of the earlier studies cited above which indicate that retarded and normal subjects were homogeneous in learning; they are inconsistent with results of the studies cited above which suggested that retarded subjects responded less adequately. They also are consistent with results of the earlier studies cited above which indicated that normal and superior subjects respond with similar adequacy to verbal tasks.

In sum, intellectually retarded, normal, and superior subjects differed in learning and the critical component in these differences appears to be mental age. To some extent, MA interacted with the task characteristics to affect learning. The primary influence in this interaction appeared to be task difficulty. That is, exceptions to

the relationship in which subjects who had higher intelligence performed more adequately were the following. The retarded and normal subjects did not differ on the concept formation task composed of nonsense syllables; the retarded, normal, and superior subjects did not differ on the problem solving task consisting of object level words; and the normal and superior subjects did not differ on the concept formation and problem solving tasks containing object level words and the problem solving task involving nonsense syllables. In an earlier discussion of the effects of the task materials variables--complexity level and abstractness level--it was pointed out that these tasks generally were the more difficult tasks.

This task difficulty X MA interaction needs to be explored further. It may be limited to the population sampled. That is, the upper limit of MA was 16 years 6 months for the normal subjects and 22 years 10 months for the superior subjects. That is high. Yet, the subjects were still children and young adolescents. Perhaps, when the tasks were administered, they reached the upper limit of what they were able to do at their stage of maturation and experience. Whether the observed relationships would persist if older, more experienced subjects were sampled would bear further investigation.

Effects of Sex Singly and Combined with the Task Materials Variables

The research objectives for sex pertain to two problems: the relationship between the learning of males and females; and the consistency of this relationship on tasks differing in complexity, abstractness, and length.

Results

Effects of Sex

Sex affected learning on six of the twelve tasks: RL-OL-4, RL-OL-12, CF-OL, CF-2L, and PS-2L (Table 37). In each case, the females' performance exceeded that of the males.

Table 37
Effects of Sex^{a,b}

Task	Relationship	Task	Relationship	Task	Relationship
RL-NS	S1=S2	CF-NS	S1=S2	PS-NS	S1=S2
RL-OL-4	S1<S2	CF-OL	S1<S2	PS-OL	S1=S2
RL-OL-8	S1=S2	CF-1L	S1<S2	PS-1L	S1=S2
RL-OL-12	S1<S2	CF-2L	S1<S2	PS-2L	S1<S2

^aMales (S1), females (S2)

^bSource tables. Rote learning tasks: covariance analyses, Table 7; Kramer tests, Table 9. Concept formation tasks: covariance analyses, Table 10; Kramer tests, Table 12. Problem solving tasks: covariance analyses, Table 12; Kramer tests, Table 15.

Sex X Task Complexity

To some extent, sex and task complexity interacted to affect learning when task abstractness was held constant (Table 38).

1. Tasks involving nonsense syllables.

Males and females responded with similar adequacy on the rote learning, concept formation, and problem solving tasks, respectively.

2. Tasks involving words at the object level.

Females responded more adequately on the concept formation task. The responses of the groups were equivalent on the eight-word rote learning task and the problem solving task.

3. Tasks involving words at the first level of abstractness.

Females responded more adequately on the concept formation task. The responses of the groups were equivalent on the problem solving task.

4. Tasks involving words at the second level of abstractness.

Females responded more adequately on the concept formation task. The responses of the two groups were equivalent on the problem solving task.

Table 38

Interaction Effects of Task Complexity and Sex ^{a,b}

Abstractness Level	Complexity Level	Task	Relationship S1:S2
Nonsense Syllables	Rote Learning	RL-NS	S1=S2
	Concept Formation	CF-NS	S1=S2
	Problem Solving	PS-NS	S1=S2
Object Level Words	Rote Learning	RL-OL-8	S1=S2
	Concept Formation	CF-OL	S2>S1
	Problem Solving	PS-OL	S1=S2
First Level Words	Concept Formation	CF-1L	S2>S1
	Problem Solving	PS-1L	S1=S2
Second Level Words	Concept Formation	CF-2L	S2>S1
	Problem Solving	PS-2L	S2>S1

^aMales (S1), females (S2)^bSource tables. Rote learning tasks: covariance analyses, Table 7; Kramer tests, Table 9. Concept formation tasks: covariance analyses, Table 10, Kramer tests, Table 12. Problem solving tasks: covariance analyses, Table 13; Kramer tests, Table 15.

Sex X Task Abstractness

To some extent, sex and task abstractness interacted to affect learning when task complexity was held constant (Table 39).

1. Rote learning tasks

Males and females responded with equivalent adequacy on the rote learning tasks involving nonsense syllables and eight object level words.

2. Concept formation tasks

Males and females responded with equivalent adequacy on the concept formation task involving nonsense syllables. Females responded more adequately on the tasks involving words at the object level, first level of abstractness, and second level of abstractness, respectively.

3. Problem solving tasks

Males and females responded with equivalent adequacy on problem solving tasks involving nonsense syllables, words at the object level, and words at the first level of abstractness, respectively. Females responded more adequately on the problem solving task involving words at the second level of abstractness.

Sex X Task Length

Sex and task length interacted, to some extent, to affect responses to the rote learning tasks composed of object level words (Table 40). The females responded more adequately on tasks involving four and twelve words, respectively. The two groups responded with similar adequacy on the task involving eight words.

Discussion

McGeoch and Irion (1952, p. 551) commented that results^{of} a large number of comparisons of the learning of the sexes "have signally failed to show any constancy of direction. Instead, they group around three modes (a) those which show a difference in favor of males; (b) those which show a difference in favor of females; and (c) those which show no significant difference between the sexes." The results of the present investigation were consistent with modes ~~A~~^C and B: differences occurred only on half of the total group of tasks and these differences were in favor of the females. The effect of sex interacted, to some extent, with the task characteristics. That is, three of the six differences occurred on the concept formation tasks involving words at the object level, and the first and second abstractness levels. Also, differences

Table 39

Interaction Effects of Task Abstractness and Sex^{a,b}

Complexity Level	Abstractness Level	Task	Relationship S1:S2
Rote Learning	Nonsense Syllables	RL-NS	S1=S2
	Object Level Words	R1-OL-8	S1=S2
Concept Formation	Nonsense Syllables	CF-NS	S1=S2
	Object Level Words	CF-OL	S2>S1
	First Level Words	CF-1L	S2>S1
	Second Level Words	CF-2L	S2>S1
Problem Solving	Nonsense Syllables	PS-NS	S1=S2
	Object Level Words	PS-OL	S1=S2
	First Level Words	PS-1L	S1=S2
	Second Level Words	PS-2L	S2>S1

^aMales (S1), females (S2)^bSource tables. Rote learning tasks: covariance analyses, Table 8; Kramer tests, Table 9. Concept formation tasks: covariance analyses, Table 11; Kramer tests, Table 12. Problem solving tasks: covariance analyses, Table 14; Kramer tests, Table 15.

Table 40

Interaction Effects of Task Length and Sex^{a,b}

Complexity and Abstractness Level	Length	Task	Relationship S1:S2
Rote Learning Object Level	4 words	RL-OL-4	S1<S2
	8 words	RL-OL-8	S1=S2
	12 words	RL-OL-12	S1<S2

^aMales (S1), females (S2).^bSource tables: covariance analyses, Table 7; Kramer tests, Table 9.

occurred on the problem solving tasks involving the material grouped at the second abstractness level and the rote learning tasks involving four and twelve object level words.

Previous investigators who found differences in the facility with which males and females learn include Conrad and Jones (1929), Easby-Grave (1924), Pyle (1925), and Young (1922). Previous investigators who ~~are~~ reported null relationships include Blake (1961), Boynton (1931), Hicks (1931), Mattson (1933), McGinnis (1929), Perl (1933), and Wieg (1932).

Two attributes of the material are often proposed to account for sex differences in learning; these are differential motivation or interest in the material to be learned, and differential degrees to which motor manipulation is involved in the task activities. Probably, neither of these factors operated in the present investigation. Motor activity was at a minimum in the sense that only the skill involved in writing digits was required and no particular emphasis was given to time; in fact, care was taken to insure that each pupil had ample opportunity to make his responses. As far as interest was concerned, the materials were either nonsense syllables or nouns selected from a variety of areas ranging from mathematics and science through clothes and furniture. It seems

unlikely that materials more appealing to one group were employed.

Another condition would bear consideration. This pertains to differential language facility of males and females within the childhood and early adolescent populations sampled. Such differential language facility has been discussed by investigators like Fisher (1932), McCarthy (1930, 1953), Mead (1913), Shire (1945), and Smith (1926). These investigators reported that, as a group, girls in the age range studied are superior in many aspects of language. In the present study, the differences were consistently in favor of girls; also, most of the differences involved conceptualization related to more abstract material. Consequently, it is possible that differential language facility influenced the results. However, if this possibility be accepted, a question still remains about why only six of twelve tasks were thus influenced. Further research on this matter appears indicated.

SUMMARY

Problem

Purpose and Objectives

The purpose in this investigation was to study how selected task administration, task materials, and subject variables influence children's and adolescents' learning. The specific research objectives were to examine the following.

1. Effects of task complexity
2. Effects of task abstractness singly and combined with task complexity
 - a. Task abstractness
 - b. Task abstractness X task complexity
3. Effects of task length
4. Effects of method of approach singly and combined with the task materials variables
 - a. Method of approach
 - b. Method of approach X task complexity
 - c. Method of approach X task abstractness
 - d. Method of approach X task length
5. Effects of type of presentation singly and combined with method of approach and the task materials variables
 - a. Type of presentation
 - b. Type of presentation X method of approach
 - c. Type of presentation X task complexity
 - d. Type of presentation X task abstractness
 - e. Type of presentation X task length
6. Effects of intelligence level (MA and CA respectively held constant) singly and combined with the task materials variables
 - a. Intelligence level (MA=, CA#)
 - b. Intelligence level (MA=, CA#) X task complexity
 - c. Intelligence level (MA=, CA#) X task abstractness
 - d. Intelligence level (MA=, CA#) X task length
 - e. Intelligence level (CA=, MA#)
 - f. Intelligence level (CA=, MA#) X task complexity
 - g. Intelligence level (CA=, MA#) X task abstractness
 - h. Intelligence level (CA=, MA#) X task length

7. Effects of sex singly and combined with the task materials variables.

- a. Sex
- b. Sex X task complexity
- c. Sex X task abstractness
- d. Sex X task length

Educational Significance

Educational decisions are predicated on a number of bases. One of these bases is the manner in which pupils learn. Consequently, making the most efficient educational decisions is facilitated by a body of information about how pupils respond to variables of which learning is a function. The present investigation's educational significance is in its contribution to such a body of information.

Related Research

In brief, a few investigators have studied how learning is influenced by the task administration, task materials, and subject variables selected for study herein. These few investigations have yielded some valuable information; yet, important problems remain. Essentially, these problems may be reduced to two basic needs: the need to examine the generality of results obtained with adult samples when children and adolescents are sampled; and the need to examine in one comprehensive investigation or consistent setting the effects and interaction effects of several task and subject variables, both classes of which are dimensionalized systematically and sufficiently. The present investigation was designed within the framework of these needs.

Procedure

Research Design

The components of the research design were the task materials variables, task administration variables, and subject variables. The task materials variables consisted of level of complexity of the stimulus and response combinations (rote learning, concept formation, and problem solving), level of abstractness of material (nonsense syllables, object level, first level, and second level), and length of task (four, eight, and twelve units). The

task administration variables were type of presentation of material (oral-visual, oral) and method of approach or response activity required (inductive, demonstration, deduction). The subject variables included intelligence level, chronological age level, mental age level, and sex.

These components of the research design were manipulated in this way. Briefly, the subjects were given tasks under overlapping dimensions of the task administration variables; the characteristics of the tasks were defined by overlapping dimensions of the task materials variables. The overlapping dimensions of the two task materials variables yielded 12 tasks; the overlapping dimensions of the two task administration variables yielded six treatments. The overlapping dimensions of the subject variables yielded samples of intellectually retarded, normal, and superior male and female children and adolescents.

Subjects

Subjects were 261 intellectually retarded, normal, and superior children and adolescents selected from the regular and special classes of public schools. To fulfill the requirements of the research design, the sample was divided twice. The total sample was divided randomly into two subsamples. Each subsample was divided randomly into sets of six treatment subgroups labeled base cell groups.

Inferential statistics yielded by the analyses of the subject variables indicated the following. Populations sampled in the several base cell groups are homogeneous with respect to the subject characteristics analyzed: namely, MA, CA, IQ, vocabulary, and digit recall. Populations sampled in the three intelligence groups are not homogeneous in terms of the subject characteristics considered. The differences are in the expected direction. That is, superior pupils exceed retarded and normal pupils in IQ, MA, vocabulary, and digit recall; normal pupils exceed retarded pupils in all of these except digit recall. The retarded pupils exceed the normal and superior pupils in CA; the normal and superior pupils have similar in CA's.

Task Materials Variables

Three types of tasks were developed. These were labeled direct learning tasks, retention tasks, and parallel tasks.¹

The nature of the twelve direct learning tasks was defined by the overlapping dimensions of the task variables--complexity level, abstractness level, and length. The names of the resulting tasks were based on the variants involved: rote learning--nonsense syllables (RL-NS), rote learning--four object level words (RL-OL-4), rote learning--eight object level words (RL-OL-8), and rote learning--twelve object level words (RL-OL-12); concept formation--nonsense syllables (CF-NS), concept formation--words at the object level (CF-OL), concept formation--words at the first level of abstractness (CF-1L), concept formation--words at the second level of abstractness (CF-2L); problem solving--nonsense syllables (PS-NS), problem solving--words at the object level (PS-OL), problem solving--words at the first level of abstractness (PS-1L), and problem solving--words at the second level of abstractness (PS-2L).

The retention tasks were based on the twelve direct learning tasks. The retention task corresponding to any one direct learning task involved administering, after a one-week interval, the test list twice and the last sequence of trials for the direct learning task. The sequence for presenting the materials was test list, trial list, test list. The names of the retention tasks corresponded to the names of the direct learning tasks: e.g., rote learning--nonsense syllables--retention.

Administering a retention task and a direct learning task during any one administration session necessitated activities to interpolate between the two tasks in order to minimize the possibilities of either positive or negative transfer. Used for this purpose were a set of specific comments referring to expectations about differences between similar appearing tasks and the parallel tasks. The parallel tasks consisted of formats, activities, sets, etc. different from those involved in the direct learning tasks: e.g., motor facility, cancellation, coding, etc.

¹ Only data pertinent to the direct learning tasks are presented in this final report. Other data will be reported subsequently.

Task Administration Variables

The direct learning and retention tasks were administered to the subjects under the six combinations of variants resulting from the overlapping of the task administration variables--type of presentation and method of approach. Specifically, these six combinations of variants were the following: oral-visual presentation--induction approach, oral-visual presentation--demonstration approach, oral-visual presentation--deduction approach; oral presentation--induction approach, oral presentation--demonstration approach, oral presentation--deduction approach.

Data Analysis Procedures

The response measure, or score, selected to reflect direct learning was number of items correctly completed on tests based on the task materials. There was one test for each task. The test was administered six times during the task administration.

With two exceptions, the test for each task contained eight items. The exceptions were the tests for RL-OL-4 and RL-OL-12 which involved four and twelve units, respectively. When the effects of the task materials variables and the effects of intelligence level (with MA or CA respectively held constant) were analyzed, the scores for these two tasks were transformed to correspond to the eight-item scales for the remaining tasks in this way: the scores for RL-OL-4 were multiplied by 2; the scores for RL-OL-12, by 2/3.

Statistical procedures used to analyze the data included analyses of co-variance, Kramer's multiple range tests, and t -tests. The .05 probability level was the criterion for rejecting the null hypotheses.

Conclusions and Limitations

The obtained evidence would seem to justify several conclusions. Task complexity level, abstractness level of the task materials, task length, method of approach, and type of presentation, in many cases affect, or interact to affect, learning. In the aggregate influence on verbal learning exerted by intelligence level, mental age, and chronological age, mental age has the dominant effect. Task materials variables interact with this effect to some extent. Sex, in interaction with task complexity level and task and abstractness level, affects learning in some situations.

The following restrictions on generalization are noted and stressed. All conclusions are limited to populations similar to those from which the subjects were selected and to task materials variables, task administration variables, procedures, and response measures similar to those employed in the present investigation. Wider generalization is contingent upon further research.

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APPENDICES

APPENDIX A

**DIRECT LEARNING TASKS--ROTT LEARNING: PROCEDURES,
DIRECTIONS, AND BASIC TASK MATERIALS**

ROTE LEARNING TASKS

Introduction

In this task, you will work with pairs of words and numbers. You know what a pair is. A pair is two things which always go together. When you see one, you see the other. They belong together. For example, your right and left shoes are a pair. They always go together and neither one goes with anything else. You'll get the right answers in this task when you learn the pairs of words and numbers which always go together. Your job will be to learn the number parts which go with the word parts of (Choose the appropriate alternative: 4, 8, 8, or 12) word-number pairs. Then, you will apply these number parts of the pairs to the word parts of the pairs whenever the words are presented to you.

Before we begin the task, there are several things I want to tell you.

(Use the appropriate alternate.)

1. (Task composed of nonsense syllables:) The words are kind of funny little words. They are not hard to say, but they probably are different from any words you've seen or heard before.

or

1. (Tasks composed of words:) These words are common words which you've seen and heard before.

-
-
2. Remember: There is only one way that word-number pairs can be made. If a word and number make a pair one time, they always make a pair.
 3. I'm going to watch the time very closely. You will have only two seconds to write the number. So, work quickly.
 4. But work carefully and do a good job because after you put in the answers for a few, we'll have a test to see how much you have learned.
 5. Also, in addition to the test I give you today to find out how much you learn, you will be tested on the same material next week to see how much you remember over the period of a week. So learn as much as you can today. But don't worry about this test. And don't try to practice or study for it. You couldn't if you wanted to. It won't have any effect on your grades or work in class. It just helps us know more about how people learn. So just work hard and don't worry.

Restatement of Required
Activity and Presentation of Clue

1. Remember what your job is: to learn the number which goes with each word and to remember it so that you can apply the number part of the pair when the word part of the pair is presented to you.
2. Listen carefully and I'll give you a clue which will help you. When a word and a number are a pair, that number will always go with that word and it will never go with another word.

Distribution of Materials

(Hand out task booklets.) Here are the task booklets. Look at the first page. Fill in the blanks with information I ask for. (Read each of the items--name, grade, teacher--in turn, and wait until the subjects fill in the appropriate blanks.)

Administrative Sequence

Use the following steps with the basic materials of each of the four rote learning tasks.

- Step 1. Trials¹ 1-8: Trial List No. 1
- Step 2. Test: First administration--Test List
- Step 3. Trials 9-16: Trial List No. 2
- Step 4. Test: Second administration--Test List
- Step 5. Trials 17-24: Trial List No. 3
- Step 6. Test: Third administration--Test List
- Step 7. Trials 25-32: Trial List No. 1
- Step 8. Test: Fourth administration--Test List
- Step 9. Trials 33-40: Trial List No. 2
- Step 10. Test: Fifth administration--Test List
- Step 11. Trials 41-48: Trial List No. 3
- Step 12. Test: Sixth administration--Test List

Basic Task Materials

Task 1: RL--NS
Rote Learning--Nonsense Syllables

Stimulus-Response Pairs

1. dak 71
2. bip 15
3. mev 24

Test List

1. coj _____
2. pid _____
3. mev _____

¹Task 2 trial list contains 4 units; task 4 trial lists, 12 units.

Task 1: RL--NS (continued)

Stimulus-Response Pairs

4. rux 62
 5. coj 59
 6. zug 43
 7. pid 86
 8. naf 98

Test List

4. naf _____
 5. dak _____
 6. rux _____
 7. bip _____
 8. zug _____

Trial List 1

1. mev _____
 2. dak _____
 3. zug _____
 4. bip _____
 5. coj _____
 6. rux _____
 7. pid _____
 8. naf _____

Trial List 2

1. zug _____
 2. coj _____
 3. mev _____
 4. rux _____
 5. pid _____
 6. naf _____
 7. dak _____
 8. bip _____

Trial List 3

1. dak _____
 2. mev _____
 3. pid _____
 4. naf _____
 5. bip _____
 6. coj _____
 7. zug _____
 8. rux _____

Task 2: RL--OL--4

Rote Learning--Four Object Level Words

Stimulus-Response Pairs

1. tomato 52
 2. word 79
 3. gun 26
 4. coat 17

Test List

1. gun _____
 2. coat _____
 3. tomato _____
 4. word _____

Trial List 1

1. word _____
 2. gun _____
 3. coat _____
 4. tomato _____

Trial List 2

1. gun _____
 2. tomato _____
 3. word _____
 4. coat _____

Trial List 3

1. tomato _____
 2. coat _____
 3. gun _____
 4. word _____

Task 3: RL--OL--8

Rote Learning--Eight Object Level Words

Stimulus-Response Pairs

1. chain 81
 2. carrot 72
 3. shoe 37
 4. garage 23
 5. map 49
 6. locket 58
 7. telephone 95
 8. baseball 16

Test List

1. carrot _____
 2. shoe _____
 3. chain _____
 4. baseball _____
 5. telephone _____
 6. locket _____
 7. garage _____
 8. map _____

Task 3: RL--OL--8 (continued)

Trial List 1

1. garage _____
2. locket _____
3. map _____
4. carrot _____
5. baseball _____
6. telephone _____
7. shoe _____
8. chain _____

Trial List 2

1. carrot _____
2. shoe _____
3. chain _____
4. baseball _____
5. garage _____
6. map _____
7. telephone _____
8. locket _____

Trial List 3

1. shoe _____
2. map _____
3. locket _____
4. telephone _____
5. chain _____
6. garage _____
7. carrot _____
8. baseball _____

Task 4: RL--OL--12

Rote Learning--Twelve Object Level Words

Stimulus-Response Pairs

- | | |
|-----------------|----|
| 1. library | 61 |
| 2. zoo | 93 |
| 3. milk | 39 |
| 4. chimney | 29 |
| 5. needle | 57 |
| 6. box | 85 |
| 7. letter | 73 |
| 8. pencil | 18 |
| 9. handkerchief | 42 |
| 10. key | 27 |
| 11. penny | 96 |
| 12. ice | 14 |

Test List

1. key _____
2. penny _____
3. milk _____
4. needle _____
5. ice _____
6. zoo _____
7. handkerchief _____
8. letter _____
9. chimney _____
10. box _____
11. pencil _____
12. library _____

Trial List 1

1. milk _____
2. letter _____
3. pencil _____
4. ice _____
5. needle _____
6. library _____
7. key _____
8. handkerchief _____
9. chimney _____
10. box _____
11. zoo _____
12. penny _____

Trial List 2

1. handkerchief _____
2. key _____
3. zoo _____
4. library _____
5. box _____
6. penny _____
7. ice _____
8. letter _____
9. needle _____
10. milk _____
11. pencil _____
12. chimney _____

Trial List 3

1. box _____
2. penny _____
3. ice _____
4. chimney _____
5. zoo _____
6. letter _____
7. milk _____
8. key _____
9. pencil _____
10. handkerchief _____
11. library _____
12. needle _____

APPENDIX B

**DIRECT LEARNING TASKS--CONCEPT FORMATION: PROCEDURES,
DIRECTIONS, AND BASIC TASK MATERIALS**

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CONCEPT FORMATION TASKS

Introduction

In this task, you will work with word families. You know what a family is. A family is a number of things which go together in some way. All of the family members may be different in some ways, but they are all alike in some ways--that is what makes them a family. For example, red, green, and blue are members of the same word family. They are all colors. We have given the families in this task--numbers for names. You'll find the right answers when you learn the number names which go with the word families.

Your job is to learn the number names of four different word families and to remember them so that you can apply the right number name when any member of any of the four word families is presented to you.

Before we begin the task, there are several things I want to tell you.

(Use the appropriate alternate.)

1. (Task composed of nonsense syllables:) The words are kind of funny little words. They are not hard to say, but they probably are different from any words you've seen or heard before.

or

1. (Tasks composed of words:) These words are common words which you've seen and heard before.

-
-
2. Remember: there are many different ways that words can be grouped to make a word family. If you try one way and it doesn't work, try another way.
 3. I'm going to watch the time very closely. You will have only two seconds to write the number. So, work quickly.
 4. But work carefully and do a good job because after you put in the answers for a few, we'll have a test to see how much you have learned.
 5. Also, in addition to the tests I give you today to find out how much you learn, you will be tested on this same material next week to see how much you remember over the period of a week. So learn as much as you can today. But don't worry about this test. And don't try to practice or study for it. You couldn't if you wanted to. It won't have any effect on your grades or work in class. It just helps us know how people learn. So just work hard and don't worry.

Restatement of Required
Activity and Presentation of Clue

1. Remember what your job is: to learn the number name of each of the four word families and remember them so you can apply the right number when any member of any of the four word families is presented to you.
2. Listen carefully and I'll give you a clue which will help you. When one member of a word family has a number name, the other members of the same word family will have the same number name and members of different word families never will have this number name.

Distribution of Materials

(Hand out task booklets.) Here are the task booklets. Look at the first page. Fill in blanks with the information I ask for. (Read each of the items--name, grade, teacher--in turn; wait until the subjects fill in the appropriate blanks.)

Administrative Sequence

Use the following steps with the basic materials of each of the four concept formation tasks.

- Step 1. Trials 1-8: Trial List No. 1
- Step 2. Test: First administration--Test List
- Step 3. Trials 9-16: Trial List No. 2
- Step 4. Test: Second administration--Test List
- Step 5. Trials 17-24: Trial List No. 3
- Step 6. Test: Third administration--Test List
- Step 7. Trials 25-32: Trial List No. 4
- Step 8. Test: Fourth administration--Test List
- Step 9. Trials 33-40: Trial List No. 5
- Step 10. Test: Fifth administration--Test List
- Step 11. Trials 41-48: Trial List No. 6
- Step 12. Test: Sixth administration--Test List

Basic Task Materials

Task 5: CF--NS
Concept Formation--Nonsense Syllables

Classes

1. V words are 92
2. G words are 35
3. K words are 76
4. Z words are 41

Test List

1. guz _____
2. kes _____
3. var _____
4. zis _____

All

Task 5: CF--NS (continued)

Test List

5. kug _____
6. gov _____
7. zal _____
8. vit _____

Trial List 1

1. zab _____
2. geh _____
3. koz _____
4. vuj _____
5. gim _____
6. kel _____
7. vac _____
8. zom _____

Trial List 2

1. kaz _____
2. vod _____
3. zer _____
4. gub _____
5. veb _____
6. zut _____
7. goc _____
8. kif _____

Trial List 3

1. kuh _____
2. gaw _____
3. zic _____
4. vof _____
5. vam _____
6. kib _____
7. gos _____
8. zud _____

Trial List 4

1. giz _____
2. zeg _____
3. vup _____
4. koj _____
5. zog _____
6. viq _____
7. kax _____
8. gep _____

Trial List 5

1. gux _____
2. kam _____
3. zaj _____
4. voy _____
5. ven _____
6. zop _____
7. kuv _____
8. gid _____

Trial List 6

1. zun _____
2. gef _____
3. vil _____
4. kaq _____
5. kip _____
6. vuz _____
7. gak _____
8. zev _____

Task 6: CF--OL

Concept Formation--Words at the Object Level

Classes

1. S words are 53
2. B words are 19
3. F words are 87
4. L words are 68

Test List

1. film _____
2. baggage _____
3. salary _____
4. lollipop _____
5. silk _____
6. bone _____
7. lawn _____
8. friend _____

Trial List 1

1. bat _____
2. shop _____
3. fort _____
4. lumber _____
5. lantern _____
6. blackberry _____
7. freezer _____
8. scale _____

Trial List 2

1. fence _____
2. list _____
3. book _____
4. shadow _____
5. face _____
6. sandal _____
7. loaf _____
8. bomber _____

Trial List 3

1. leg _____
2. bread _____
3. school _____
4. fire _____
5. shell _____
6. fairground _____
7. bucket _____
8. lad _____

Task 6: CF--OL (Continued)

Trial List 4

1. barber _____
2. light _____
3. feather _____
4. sapphire _____
5. fountain _____
6. seesaw _____
7. log _____
8. bell _____

Trial List 5

1. button _____
2. field _____
3. signal _____
4. lock _____
5. scarf _____
6. lullaby _____
7. bracelet _____
8. forest _____

Trial List 6

1. leather _____
2. bench _____
3. football _____
4. saddle _____
5. liver _____
6. song _____
7. flag _____
8. baby _____

Task 7: CF--1L

Concept Formation--Words at the First Level of Abstractness

Classes

1. Weather words are 75
2. Tree words are 28
3. Flower words are 91
4. Mammal words are 47

Test List

1. cypress _____
2. tornado _____
3. zinnia _____
4. cat _____
5. frost _____
6. poppy _____
7. elephant _____
8. sycamore _____

Trial List 1

1. pine _____
2. typhoon _____
3. carnation _____
4. ape _____
5. lightning _____
6. orchid _____
7. rabbit _____
8. chestnut _____

Trial List 2

1. jonquil _____
2. tiger _____
3. birch _____
4. sleet _____
5. wolf _____
6. maple _____
7. blizzard _____
8. lily _____

Trial List 3

1. geranium _____
2. cloudburst _____
3. willow _____
4. beaver _____
5. mist _____
6. zebra _____
7. daisy _____
8. elm _____

Trial List 4

1. squirrel _____
2. mimosa _____
3. crocus _____
4. drought _____
5. sweetgum _____
6. humidity _____
7. kangaroo _____
8. aster _____

Trial List 5

1. fox _____
2. hurricane _____
3. magnolia _____
4. dahlia _____
5. spruce _____
6. goldenrod _____
7. cow _____
8. haze _____

Trial List 6

1. giraffe _____
2. whirlwind _____
3. dandelion _____
4. chinaberry _____
5. nasturtium _____
6. pecan _____
7. fog _____
8. horse _____

Task 8: CF--2L

Concept Formation: Words at the Second Level of Abstractness

Classes

1. Transportation words are 37
2. Human words are 82
3. Invertebrate animal words are 13
4. Measurement words are 51

Test List

1. helicopter _____
2. swimmer _____
3. caterpillar _____
4. ounce _____
5. automobile _____
6. octopus _____
7. woman _____
8. mile _____

A13
Task 8: CF--2L (continued)

Trial List 1

1. leech _____
2. airplane _____
3. eighth _____
4. golfer _____
5. yesterday _____
6. hand _____
7. dragonfly _____
8. trolley _____

Trial List 4

1. gentleman _____
2. tick _____
3. pint _____
4. bicycle _____
5. crab _____
6. first _____
7. beacon _____
8. nurse _____

Trial List 2

1. buoy _____
2. hornet _____
3. grandfather _____
4. quart _____
5. doctor _____
6. third _____
7. rocket _____
8. snail _____

Trial List 5

1. dirigible _____
2. inch _____
3. nose _____
4. firefly _____
5. oyster _____
6. girl _____
7. truck _____
8. pound _____

Trial List 3

1. barge _____
2. man _____
3. lobster _____
4. noon _____
5. dozen _____
6. subway _____
7. farmer _____
8. earthworm _____

Trial List 6

1. bushel _____
2. starfish _____
3. elbow _____
4. canoe _____
5. submarine _____
6. century _____
7. butterfly _____
8. fisherman _____

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APPENDIX C

**DIRECT LEARNING TASKS--PROBLEM SOLVING: PROCEDURES,
DIRECTIONS, AND BASIC TASK MATERIALS**

PROBLEM SOLVING TASKS

Introduction

In this task, you will work with a rule or principle. You know what a rule is. A rule tells how several things are related, how they go together. For example $2+3 = 5$ is a rule. It tells how a group of 2 things goes with a group of 3 things to make 5 things. It always holds or applies. When you have 2 things and you want 5 things, you always have to get 3 more things. You will be using a rule with word families. A family is a number of things which go together in some way. All of the family members may be different in some ways, but they are alike in some ways--that is what makes them a family. We have given the word families in this task--numbers for names. You will find the right answers when you find the rule that tells you how the word families and number names go together.

You will be given the number names of four word families, and your job is to learn the rule or principle and remember it so that you can apply it to find the word families which go with these number names.

Before we begin the task, there are several things I want to tell you.

(Use the appropriate alternate.)

1. (Task composed of nonsense syllables:) The words are kind of funny little words. They are not hard to say, but they probably are different from any words you've seen or heard before.

or

1. (Tasks composed of words:) The words are common words which you've seen and heard before.

-
-
2. Remember: there are many different rules; that is, there are many different ways you can put things together. If you try one rule and it doesn't work, quickly try another way to see if it is the right one.
 3. I'm going to watch the time very closely. You will have only two seconds to write the number. So work quickly.
 4. But work carefully and do a good job because after you put in the answers for a few, we'll have a test to see how much you have learned by using the rule.

5. Also, in addition to the tests I give you today to find out how much you learn, you will be tested on this same material next week to see how much you remember over the period of a week. So learn as much as you can today. But don't worry about this test. And don't try to practice or study for it. You couldn't if you wanted to. It won't have any effect on your grades or work in class. It just helps us to know more about how people learn. So just work hard and don't worry.

Restatement of Required
Activity and Presentation of Clue

1. Remember what your job is: to learn the rule or principle and remember it so that you can apply it to find the four word families that go with the four number names you are given.
2. Listen carefully and I'll give you a clue which will help you. When a number name goes with a word-family, it always goes with that word-family and never goes with another word-family.

Distribution of Materials

(Hand out task booklets.) Here are the task booklets. Look at the first page. Fill in the blanks with the information I ask for. (Read each of the items --name, grade, teacher --in turn, and wait until the subjects fill in the appropriate blank.)

Administrative Sequence

Use the following steps with the basic materials of each of the four problem solving tasks

- Step 1. Trials 1-4: Trial List No. 1
- Step 2. Test: First administration--Test List
- Step 3. Trials 5-8: Trial List No. 2
- Step 4. Test: Second administration--Test List
- Step 5. Trials 9-12: Trial List No. 3
- Step 6. Test: Third administration--Test List
- Step 7. Trials 13-16: Trial List No. 1
- Step 8. Test: Fourth administration--Test List
- Step 9. Trials 17-20: Trial List No. 2
- Step 10. Test: Fifth administration--Test List
- Step 11. Trials 21-24: Trial List No. 3
- Step 12. Test: Sixth administration--Test List

Basic Task MaterialsTask 9: PS--NS
Problem Solving--Nonsense SyllablesOrganizational Principle

If two members of the same word family appear both the first and second times with the same number, then that number is the name of the word family. If a member of one word family appears the first time with the number and a member of a different word family appears the second time with the number, then that number is not the name of the word family.

Example

A B + / / D A + +

A is + because A appears with + both the first and second times. Neither B nor D is + because each one appears with + only one time.

Classes

1. M words are 83
2. T words are 32
3. J words are 78
4. Y words are 54

Test List

1. maf _____
2. tob _____
3. jup _____
4. yil _____
5. tuz _____
6. mip _____
7. yan _____
8. jev _____

Trial List 1

- | | | | | |
|--------|-------------|-----|-----------|-------|
| 1. jul | taw _____// | yoz | jic _____ | _____ |
| 2. mig | yax _____// | jor | yuj _____ | _____ |
| 3. tof | mun _____// | mer | yim _____ | _____ |
| 4. tis | jah _____// | tem | mot _____ | _____ |

Trial List 2

- | | | | | |
|--------|-------------|-----|-----------|-------|
| 1. yut | tes _____// | tid | jeq _____ | _____ |
| 2. yag | tur _____// | yok | mij _____ | _____ |
| 3. jos | toj _____// | mez | jad _____ | _____ |
| 4. jed | mav _____// | jiz | mol _____ | _____ |

Trial List 3

- | | | | | |
|--------|-------------|-----|-----------|-------|
| 1. yov | jum _____// | yev | mox _____ | _____ |
| 2. jeg | yif _____// | tiv | jat _____ | _____ |
| 3. tuh | mab _____// | mus | yub _____ | _____ |
| 4. jow | tef _____// | mec | taz _____ | _____ |

Task 10: PS--OL
Problem Solving--Words at the Object Level

Organizational Principle

If two members of the same word family appear both the first and second times with the same number, then the number is the name of the word family. If a member of one word family appears the first time with the number and a member of a different word family appears the second time with the number, then that number is not the name of the word family.

Example

A B + // D A + +

A is + because A appears with + both the first and second times. Neither B nor D is + because each one appears with + only one time.

Classes

1. R words are 31
2. P words are 56
3. W words are 25
4. D words are 97

Test List

1. robe _____
2. pocket _____
3. wheel _____
4. doughnut _____
5. pipe _____
6. ribbon _____
7. wigwam _____
8. drum _____

Trial List 1

1. wire paint _____ // diamond war _____
2. rag drainpipe _____ // wing doll _____
3. pebble rodeo _____ // record desert _____
4. post wool _____ // pickaxe rifle _____

Trial List 2

1. diaper prize _____ // playhouse wedding _____
2. door peg _____ // dust race _____
3. whistle paper _____ // rope wood _____
4. dial ruby _____ // web rice _____

Trial List 3

1. deck wristwatch _____ // diary roof _____
2. whip den _____ // pole wallet _____
3. paddle razor _____ // ring dagger _____
4. window platform _____ // rhyme pearl _____

Task 11: PS--1L
Problem Solving--Words at the First Level of Abstractness

Organizational Principle

If two members of the same word family appear both the first and second times with the same number, then the number is the name of the word family. If a member of one word family appears the first time with the number and a member of a different word family appears the second time with the number, then that number is not the name of the word family.

Example

A B + // D A + +

A is + because A appears with + both the first and second times. Neither B nor D is + because each one appears with + only one time.

Classes

1. Time words are 89
2. Insect words are 94
3. Fruit words are 63
4. Family words are 46

Test List

1. year _____
2. Horsefly _____
3. peach _____
4. father _____
5. lemon _____
6. niece _____
7. afternoon _____
8. wasp _____

Trial List 1

1. apple minute _____ // grasshopper decade _____
2. orange mother _____ // tomorrow lime _____
3. evening weevil _____ // scorpion cousin _____
4. grandson banana _____ // brother termite _____

Trial List 2

1. mosquito day _____ // avocado gnat _____
2. uncle summer _____ // daughter pineapple _____
3. grandmother second _____ // autumn bumblebee _____
4. stepbrother plum _____ // grape centipede _____

Trial List 3

1. apricot baby _____ // cricket nephew _____
2. sister chigger _____ // cockroach morning _____
3. tangerine midnight _____ // wife grapefruit _____
4. month beetle _____ // winter cherry _____

Task 12: PS--2L

Problem solving--Words at the Second Level of Abstractness

Organizational Principle

If two members of the same word family appear both the first and second times with the same number, then the number is the name of the word family. If a member of one word family appears the first time with the number and a member of a different word family appears the second time with the number, then that number is not the name of the word family.

Example

A B + // D A + +

A is + because A appears with + both the first and second times. Neither B nor D is + because each one appears with + only one time.

Classes

1. Earth feature words are 69
2. Plant words are 45
3. Vertebrate animal words are 33
4. Household words are 74

Test List

1. lake _____
2. python _____
3. chair _____
4. marigold _____
5. lamp _____
6. hickory _____
7. dirt _____
8. owl _____

Trial List 1

1. salmon river _____ // petunia frog _____
2. vase boxwood _____ // hawk alfalfa _____
3. mountain refrigerator _____ // dish holly _____
4. moon alligator _____ // clay bed _____

Trial List 2

1. cedar snow _____ // valley robin _____
2. rose cloud _____ // oats desk _____
3. shark mud _____ // toaster lizard _____
4. oak napkin _____ // monkey quilt _____

Trial List 3

1. violet turtle _____ // ivy cup _____
2. trout clover _____ // ocean dog _____
3. thunder pillow _____ // rug honeysuckle _____
4. minnow hill _____ // sofa rainbow _____

APPENDIX D

RETENTION TASKS--ROTE LEARNING, CONCEPT FORMATION, AND PROBLEM
SOLVING: PROCEDURES, DIRECTIONS, AND BASIC TASK MATERIALS

Introduction

Here is the retention task. (Distribute task booklets and have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.) Now, let's review briefly the task we had last week.

Restatement of Required Activity

(Use the appropriate alternate.)

1. R L tasks--Retention (RL-NS, RL-OL-4, RL-OL-8, or RL-OL-12)
Your job was to learn the number parts which go with the word parts of [4, 8, 8, or 12] word-number pairs and to apply these number parts of the pairs to the word parts of the pairs whenever you saw them.
 2. C F tasks--Retention (CF-NS, CF-OL, CF-1L, or CF-2L)
Your job was to learn the number names of four word families and to remember them so that you could apply those number names when any member of a word family was presented to you.
 3. P S tasks--Retention (PS-NS, PS-OL, PS-1L, or PS-2L)
You were given the number names of four word families and your job was to learn the rule or principle and remember it so that you could apply it to find the word families which went with these number names.
-

Administration of the Task

First, we'll have a test over the material we learned last week.
(Administer test list.)

Now let's do a few trials and one more test. You remember how we did those trials. (Recapitulate, as appropriate, procedures for induction, deduction, and demonstration variants and for the oral and the oral-visual variants. Exception: for groups receiving the deduction variants do not present the generalizations--the stimulus-response pairs, the classes, or the organizational principle.)

Administrative Sequence

Use the following steps with the materials of each of the retention tasks.

- Step 1. Test: First administration--Test List.
- Step 2. Trial List: Final trial list of direct learning form of the task.
- Step 3. Test: Second administration--Test List.

Basic Task Materials

Task 13: RL--NS
 Rote Learning--Nonsense Syllables

Test List

1. coj _____
2. pid _____
3. mev _____
4. naf _____
5. dak _____
6. rux _____
7. bip _____
8. zug _____

Trial List

1. dak _____
2. mev _____
3. pid _____
4. naf _____
5. bip _____
6. coj _____
7. zug _____
8. rux _____

Task 14: RL--OL--4
 Rote Learning--Four Object Level Words

Test List

1. gun _____
2. coat _____
3. tomato _____
4. word _____

Trial List

1. tomato _____
2. coat _____
3. gun _____
4. word _____

Task 15: RL--OL--8
 Rote Learning--Eight Object Level Words

Test List

1. carrot _____
2. shoe _____
3. chain _____
4. baseball _____
5. telephone _____
6. locket _____
7. garage _____
8. map _____

Trial List

1. shoe _____
2. map _____
3. locket _____
4. telephone _____
5. chain _____
6. garage _____
7. carrot _____
8. baseball _____

Task 16: RL--OL--12
 Rote Learning--Twelve Object Level Words

Test List

1. key _____
2. penny _____
3. milk _____
4. needle _____
5. ice _____

Trial List

1. box _____
2. penny _____
3. ice _____
4. chimney _____
5. zoo _____

Task 16: RL--OL--12 (continued)

Test List

6. zoo _____
7. handkerchief _____
8. letter _____
9. chimney _____
10. box _____
11. pencil _____
12. library _____

Trial List

6. letter _____
7. milk _____
8. key _____
9. pencil _____
10. handkerchief _____
11. library _____
12. needle _____

Task 17: CF--NS
 Concept Formation--Nonsense Syllables

Test List

1. guz _____
2. kes _____
3. var _____
4. zis _____
5. kug _____
6. gov _____
7. zal _____
8. vit _____

Trial List

1. zun _____
2. gef _____
3. vil _____
4. kaq _____
5. kip _____
6. vuz _____
7. gak _____
8. zev _____

Task 18: CF--OL
 Concept Formation--Words at the Object Level

Test List

1. film _____
2. baggage _____
3. salary _____
4. lollipop _____
5. silk _____
6. bone _____
7. lawn _____
8. friend _____

Trial List

1. leather _____
2. bench _____
3. football _____
4. saddle _____
5. liver _____
6. song _____
7. flag _____
8. baby _____

Task 19: CF--1L
 Concept Formation--Words at the First Level of Abstractness

Test List

1. cypress _____
2. tornado _____
3. zinnia _____
4. cat _____
5. frost _____
6. poppy _____
7. elephant _____
8. sycamore _____

Trial List

1. giraffe _____
2. whirlwind _____
3. dandelion _____
4. chinaberry _____
5. nasturtium _____
6. pecan _____
7. fog _____
8. horse _____

Task 20: CF-2L

Concept Formation--Words at the Second Level of Abstractness

Test List

1. helicopter _____
2. swimmer _____
3. caterpillar _____
4. ounce _____
5. automobile _____
6. octopus _____
7. woman _____
8. mile _____

Trial List

1. bushel _____
2. starfish _____
3. elbow _____
4. canoe _____
5. submarine _____
6. century _____
7. butterfly _____
8. fisherman _____

Task 21: PS--NS

Problem Solving--Nonsense Syllables

Test List

1. maf _____
2. tob _____
3. jup _____
4. yil _____
5. tuz _____
6. mip _____
7. yan _____
8. jev _____

Trial List

- | | | | | | |
|--------|-----|--------|-----|-----|-------|
| 1. yov | jum | ____// | jeb | mox | _____ |
| 2. jeg | yif | ____// | tiv | jat | _____ |
| 3. tuh | mab | ____// | mus | yub | _____ |
| 4. jow | tef | ____// | mec | taz | _____ |

Task 22: PS--OL

Problem Solving--Words at the Object Level

Test List

1. robe _____
2. pocket _____
3. wheel _____
4. doughnut _____
5. pipe _____
6. ribbon _____
7. wigwam _____
8. drum _____

Trial List

- | | | | | | |
|-----------|------------|--------|-------|--------|-------|
| 1. deck | wristwatch | ____// | diary | roof | _____ |
| 2. whip | den | ____// | pole | wallet | _____ |
| 3. paddle | razor | ____// | ring | dagger | _____ |
| 4. window | platform | ____// | rhyme | pearl | _____ |

Task 23: PS--1L

Problem Solving--Words at the First Level of Abstractness

Test List

1. year _____
2. horsefly _____
3. peach _____
4. father _____
5. lemon _____
6. niece _____
7. afternoon _____
8. wasp _____

Trial List

- | | | | | | |
|--------------|----------|--------|-----------|------------|-------|
| 1. apricot | baby | ____// | cricket | nephew | _____ |
| 2. sister | chigger | ____// | cockroach | morning | _____ |
| 3. tangerine | midnight | ____// | wife | grapefruit | _____ |
| 4. month | beetle | ____// | winter | cherry | _____ |

Task 24: PS--2L

Problem Solving--Words at the Second Level of Abstractness

Test List

1. lake _____
2. python _____
3. chair _____
4. marigold _____
5. lamp _____
6. hickory _____
7. dirt _____
8. owl _____

Trial List

- | | | | | | | |
|------------|--------|-------|----|-----------------|-------|-------|
| 1. violet | turtle | _____ | // | ivy cup | _____ | _____ |
| 2. trout | clover | _____ | // | ocean dog | _____ | _____ |
| 3. thunder | pillow | _____ | // | rug honeysuckle | _____ | _____ |
| 4. minnow | hill | _____ | // | sofa rainbow | _____ | _____ |

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APPENDIX E

PARALLEL TASKS: PROCEDURES, DIRECTIONS,
AND BASIC TASK MATERIALS

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TASK 25: DRAWING A FENCE

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task, you will work with some figures. Turn to the first page. Look at the figures drawn at the top. Your job will be to see how many of these you can make in the same order as they are shown. You are to go across the page and fill in as many boxes as you can. Watch me to see how they must be done. (Draw across the top line and through two repetitions of the series shown at the top of the page.) All right, are there any questions? Look up at the top of the page as often as you need to, to see what to draw. (Be sure subjects understand not to break the sequence when starting new lines.)

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in the 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page.) Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

[illegible]

TASK 26: DRAWING A MAN

Procedures and Directions

Identification. (Have subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task, you will work with a figure of a man. Turn to the first page. Look at the figure drawn at the top. Your job will be to see how many men you can draw in the boxes. Go across the page, and remember, your figures must be exactly like the one at the top of the page. Watch me to see how they must be done. (Draw several.) All right, are there any questions? Look up at the top of the page as often as you need to to see what to draw.

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (To the blank page.) Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trial 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

A36

Basic Task Materials



					

TASK 27: NUMBERS FORWARD

Procedures and Directions

Identification. (Have subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task, you will work with numbers. Turn to the first page. Look at the numbers at the top of the page. Your job will be to work as fast as you can, and to write these numbers in the boxes just as they are written at the top of the page. You are to go across the page and fill in as many boxes as you can. Watch me to see how they must be done. (Illustrate.) All right, are there any questions? Look up at the top of the page as often as you need to, to see what to write.

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page). Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

18 19 20 21 22 23 24 25 26 27

28 29 30 31 32 33 ---

This image shows a full page of blank graph paper. The grid consists of 10 columns and 10 rows of squares, formed by thin black lines on a white background. There are no margins, text, or other markings on the page.

TASK 28: NUMBERS INVERTED

Procedures and Directions

Identification. (Have subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task you will work with upside-down numbers. Turn to the first page. Look at the upside-down numbers at the top of the page. Your job will be to work as fast as you can, and write these numbers in the boxes just as they are written at the top of the page. You are to go across the page and fill in as many boxes as you can. Watch me to see how they must be done. (Illustrate) All right, are there any questions? (Do not allow subjects to invert task pages during the task administration.) Look up at the top of the page as often as you need to to see what to write.

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page). Now, put your pencil down and rest. (Allow 30 seconds rest).

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials

[illegible]

TASK 29: ALPHABET FORWARD

Procedures and Directions

Identification. (Have subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task you will work with letters. Turn to the first page. Look at the letters at the top of the page. Your job will be to work as fast as you can, and write these letters in the boxes just as they are written at the top of the page. You are to go across the page and fill in as many boxes as you can. Watch me to see how they must be done. (Illustrate.) All right, are there any questions? Look up at the top of the page as often as you need to to see what to write.

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page). Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

TASK 30: ALPHABET INVERTED

Procedures and Directions

Identification. (Have subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task, you will work with upside-down letters. Turn to the first page. Look at the upside-down letters at the top of the page. Your job will be to work as fast as you can, and write these letters in the boxes just as they are written at the top of the page. You are to go across the page and fill in as many boxes as you can. Watch me to see how they must be done. (Illustrate) All right, are there any questions? Look up at the top of the page as often as you need to to see what to write. (Do not allow subjects to invert task pages during the task administration.)

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page). Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials

[illegible]

TASK 31: NUMBER CANCELLATION

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task, you will work with groups of numbers. Turn to the first page. Look at the single numbers above the line at the top of the page--the 2, the 9, and the 6. Now look at the groups of numbers below the line -- there are 3 numbers in each group. Some of these number groups have the 2, the 9, or the 6 in them; i.e., there's a 2, a 9, or a 6 and two other numbers in the group. Some of these number groups don't have either the 2, the 9, or the 6 in them. Your job is to draw a circle around each number group which has either the 2, the 9, or the 6 in it. If a group doesn't have the 2, the 9, or the 6 in it, do not mark it at all. Look up at the top of the page as often as you have to to see what numbers you're looking for. Go across the page when you are working.

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page.) Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials

	2		9		6	
503	155	684	433	490	302	357
718	307	170	210	747	500	110
435	838	568	109	331	431	117
841	935	340	328	585	516	388
747	114	705	514	604	740	801
597	782	184	385	708	834	860
779	570	442	334	175	235	505
136	723	771	953	553	709	350
443	885	717	507	482	394	380
140	317	632	718	457	815	884
735	458	518	175	734	453	521
836	948	552	184	850	492	713
633	711	715	343	840	337	287
740	470	135	705	171	759	165
834	413	783	581	524	316	387
835	971	480	858	304	770	891
310	787	654	578	732	141	540
832	509	717	167	274	447	454
375	387	850	575	951	823	443
473	814	453	307	184	476	808

TASK 32: LETTER CANCELLATION

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task you will work with groups of letters. Turn to the first page. Look at the single letters above the line at the top of the page--the C, the J, and the G. Now, look at the groups of letters below the line--there are 3 letters in each group. Some of these letter groups have the C, the J, or the G in them; i.e., there is a C, a J, or a G and two other letters in a group. Some of these letter groups don't have either the C, the J, or the G, in them. Your job is to draw a circle around each letter group which has either the C, the J, or the G in it. If a group doesn't have the C, the J, or the G in it, do not mark it at all. Look up at the top of the page as often as you have to, to see what hidden letters you're looking for. Go across the page when you are working.

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page). Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials

C			J		G	
FAD	BFF	GIE	EDD	EJA	DAC	DFH
HBI	DAH	BHA	CAB	HEH	FFA	BBA
EDF	IDI	FGI	BAJ	DDB	EDB	BBH
IEB	JED	DEA	DCI	FIF	FBG	DII
HEH	BBE	HAF	FBE	GAE	HEA	IAB
FJH	HIC	BIE	DIF	HAI	IDE	IGA
HHJ	FHA	EFC	DDE	BHF	CDF	FAF
BDG	HCD	HHB	FAH	EIC	DJE	DIA
EED	HIF	HBH	FAH	EIC	DJE	DIA
BEA	DBH	GDC	HBI	EFH	IBF	IIE
HDF	EFI	FBI	BHF	HDE	EFD	FCB
IDG	JEI	FFC	BIE	IFA	EJC	HBD
GDD	HBB	HBF	DED	IDA	DDH	CIH
HEA	EHA	BDF	HAF	BHB	HFJ	BGF
IDE	EBD	HID	FIB	FCE	DBG	DIH
IDF	JHD	EIA	IFI	DAE	HHA	IJB
DBA	HIH	GFE	FHI	HDC	BEB	FEA
IDC	FAJ	HBH	EBH	CHE	EEH	EFE
DHF	DIH	IFA	FHF	JFB	ICD	EED
EHD	IBE	EFD	DAH	BIE	EHG	IAI

TASK 33: NUMBER COMPARISON

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task you will work with groups of numbers. Turn to the first page. Look at the sets of number groups at the left side of the page. One part of the set is in column one, one part is in column two. There is a line between the two parts of each set. Your job is to compare each set of number groups--the first, the second, etc. If the numbers in the first number group in column one and the numbers in the first number group in column two are exactly alike, you put a ✓ on the line between them. If the numbers in the two number groups are not exactly alike, you put an X on the line between them. We have this written above the two lines: ✓ when the pairs are alike; X when they are different. Look up at the top of the page as often as you need to. You will have to look very carefully; because, the number groups which are different are only different in one number. When they are different, all the numbers in the two number groups in the set will be the same except for one number which will be different. Work down the page on the left side; then work down the page on the right side if you have time.

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page). Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials✓ when the same; X when different.

503155684	_____	503144684	433490302	_____	433490302
718307170	_____	718307170	210747500	_____	320747500
435838568	_____	424838568	109331431	_____	109331431
841935340	_____	841935340	328585516	_____	328585527
747114705	_____	746014705	514604740	_____	514604740
597782184	_____	597682174	385708834	_____	385708834
779570442	_____	779460442	334175235	_____	334175235
136723771	_____	136723771	953553709	_____	953554809
443885717	_____	443885717	507482390	_____	617482394
140317632	_____	140317522	718457815	_____	718457815
735458518	_____	735458518	175734453	_____	175734563
836949552	_____	726948552	184850492	_____	184850492
633711715	_____	633710615	343840337	_____	343840337
740470135	_____	740470135	705171759	_____	705231759
834413783	_____	834413783	581524316	_____	581524327
835971480	_____	835971480	858304770	_____	859404770
310787654	_____	310787643	578732141	_____	578732141
832509717	_____	722509717	167274447	_____	167274447
375387850	_____	375387850	575951823	_____	586951823
473814453	_____	473814453	307184476	_____	370195476

TASK 34: LETTER COMPARISON

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task you will work with groups of letters. Turn to the first page. Look at the sets of letter groups on the left side of the page. One part of the set is in column one, one part is in column two. There is a line between the two parts of each set. Your job is to compare each set of letter groups--the first, the second, column etc. If the letters in the first letter group in column one and the letters in the first letter group in column two are exactly alike, you put a ✓ on the line between them. If the letters in the two letter groups are not exactly alike, you put an X on the line between them. We have this written above the two lines: ✓ when the pairs are alike; X when they are different. Look up at the top of the page as often as you need to. You will have to look very carefully; because, the letter groups which are different are only different in one letter. When they are different--all the letters in the two groups in the set will be the same except for one letter which will be different. Work down the page on the left side; then work down the page on the right side if you have time.

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page.) Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials✓ when the same; X when different.

FADBFFGIE _____	FADBEEGIE _____	EDDEHADAC _____	EDDEJADAC _____
HBIDAHBHA _____	HBIDAHBHA _____	CEAHEHFAA _____	DCAHEHFAA _____
EDFIDIFGI _____	ECEIDIFGI _____	BAJDDBEDB _____	BAJDDBEDB _____
IEBJFDDEA _____	IEBJFDDEA _____	DCIFIFFBG _____	DCIFIEFCH _____
HEHBBEHAF _____	HEGABEHAF _____	FBEGAEHEA _____	FBEGAEHEA _____
FJHHICBHD _____	FJHHICBHD _____	DIFHAIIDE _____	DIFHAIIDE _____
HHJFHAEEC _____	HHJEGAEEC _____	DDEBHFCDF _____	DDEBHFCDF _____
BDGHDCHHB _____	BDGHCDHHB _____	JFDFFDPAJ _____	JFDFFEIAJ _____
EEDHIFHBH _____	EEDHIFHBH _____	FAHEICDJE _____	GBHEICDJE _____
BEADBHGDC _____	BEADBHFCC _____	HBIEFHIBF _____	HBIEFHIBF _____
HDFEFIFBI _____	HDFEFIFBI _____	BHFHDEEFD _____	BHFHDEFCD _____
IDGJEIFFC _____	HCGJEIFFC _____	BIEIFHEJC _____	BIEIFAEJC _____
GDDHBBHBF _____	GDDHBAGBF _____	DEDIEADDH _____	DEDIEADDH _____
HEAEHABDF _____	HEAEHABDF _____	HAFBHBHFJ _____	HAFCIBHFJ _____
IDEEBDHID _____	IDEEBDHID _____	FIBFCEDBG _____	FIBFCEDCH _____
IDFJHDEIA _____	IDFJHDEIA _____	IFIDAEHHA _____	IFJEAHHA _____
DBAHINGFE _____	DBAHINGED _____	FHIHDCBEB _____	FHIHDCBEB _____
IDCFAJHBH _____	HCCFAJHBH _____	BGHCHEEEH _____	BGHCHEEEH _____
DHFDIHIFA _____	DHFDIHIFA _____	FHFJFBICD _____	FIGJFBICD _____
EHDIBEEFD _____	EHDIBEEFD _____	DAHBIEEHG _____	DAHBJFEHG _____

TASK 35: ORDINAL GROUPING--LETTERS

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task you will work with letters. Turn to the first page. Look at the lines of letters on the page. Look above the double line at the words, third, fifth, and seventh. Your job is to circle the third letter then go to the fifth letter after that and then the seventh letter after that. (Demonstrate.) After you finish the sequence of third, then fifth, and then seventh, start counting to the third letter again, etc. It doesn't matter if you have to go into the next line--keep up the sequence. Work across the page. Do not start a new sequence at the beginning of every line. Look up above the double line as often as you have to to remind yourself about the sequence of letters to circle. You will have to work carefully because the letters are very close together. Be sure not to break the sequence when you get to the end of the line.

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page.) Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial *and rest 30 seconds at the end* of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials

Third	Fifth	Seventh
F	A	D
B	F	F
G	I	E
E	D	D
E	J	A
D	A	C
D	F	H
H	B	I
D	A	H
B	H	A
C	B	A
H	E	H
F	A	A
B	B	B
A	E	D
F	I	D
I	F	G
I	B	A
J	D	D
B	E	D
B	B	B
B	H	I
E	B	J
F	D	D
E	A	D
C	I	F
I	F	F
F	B	G
D	I	I
H	E	H
B	B	E
H	A	F
F	F	B
E	G	A
E	H	E
A	I	A
B	I	B
A	I	E
D	I	F
H	A	I
I	D	E
I	G	A
H	H	J
F	H	A
E	E	C
D	D	E
B	H	F
C	D	F
F	F	A
F	A	F
B	D	G
H	C	D
H	H	B
J	D	F
F	F	D
H	A	J
D	F	A
E	E	D
H	I	F
H	B	H
F	A	H
E	I	C
D	J	E
D	I	A
B	E	A
D	B	H
G	D	C
H	B	I
E	F	H
I	B	F
I	E	I
H	D	E
E	F	D
F	C	B
I	D	G
J	E	I
F	F	C
B	I	E
I	F	A
E	J	C
H	B	D
G	D	D
H	B	B
H	B	F
D	E	D
I	E	A
D	D	H
C	I	H
H	E	A
E	H	A
B	D	F
H	A	F
B	H	B
H	F	J
B	G	F
I	D	E
E	B	D
H	I	D
F	I	B
F	C	D
E	B	G
D	I	H
I	D	F
J	H	D
E	I	A
I	F	I
D	A	E
H	H	A
I	J	B
D	B	A
H	I	H
G	F	E
F	H	I
H	D	C
B	E	B
F	E	A
I	D	C
F	A	J
H	B	H
B	G	H
C	H	E
E	E	H
E	F	E
D	H	F
D	I	H
I	F	A
F	H	F
J	F	B
I	C	D
E	E	D
E	H	D
I	B	E
E	F	D
D	A	H
B	I	E
E	H	G
I	A	I

TASK 36: LETTER-NUMBER GROUPING

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet)

Description of task activity. In this task you will work with figures which go with groups of letters and with groups of numbers. Turn to the first page. Look at the four groups. There is -- a group of letters which stand alone, a group of letters with lines drawn through them, and a group of numbers which stand alone, a group of numbers with a line drawn through them. Also there are four figures of symbols at the top of the page -- a cross (+), two short lines (=), a half circle ()), and a check mark (✓). Your job is to write the figure which goes with each group of things.

Look at the example at the top of the page. What figure goes with the letter, A? Yes -- the cross (+) goes with the letter A. Actually, the cross goes with any letter which stands alone -- A, B, C, D, and all the rest. What figure goes with the letter A with the line through it? Yes -- the two little lines (=) go with the letter A with the line through it. Actually, the 2 little lines go with any letter which has a line through it. What figure goes with the number 6? Yes -- the half circle ()) goes with the number 6. Actually, the half-circle goes with any number which stands alone -- 6, 7, 1, 3 and the other numbers. What figure goes with the number 6 with the line through it? Yes -- the check (✓) goes with any number which has a line through it.

Look at the columns below the double line. Here you see numbers and letters--some stand alone and some have lines through them. Also, they are all mixed up. There is a blank space before each one. The figure has been left out. You are to write in the missing figure which belongs in each blank space. Look at the first one. It's a letter standing alone. What figure should be filled in? That's right, the cross. Now, look at the second one. It's a number standing alone. What figure goes with it? That's right, the half circle.

You should work across the page filling in the blanks with the figures which go with the groups of letters and numbers. Look at the example at the top of the page as often as you need to.

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page.) Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials

<u>+ A</u>	<u>= -A-</u>	<u>) 6</u>	<u>√ -6-</u>
___F	___2	___P	___-3-
___3	___-5-	___-W-	___-X-
___-8-	___J	___4	___8
___-9-	___-V-	___-6-	___V
___5	___-H-	___-6-	___-4-
___-7-	___-Z-	___-I-	___-7-
___A	___B	___9	___-K-
___-4-	___N	___8	___-V-
___-X-	___-I-	___-5-	___7
___6	___3	___T	___P
___3	___-8-	___-R-	___9
___-Z-	___-F-	___7	___K
___Z	___G	___M	___4
___-B-	___-9-	___-6-	___-V-
___V	___-5-	___-W-	___7
___-A-	___-H-	___-I-	___-Z-
___3	___Z	___T	___C
___-9-	___Q	___5	___-B-
___-W-	___-6-	___J	___4
___I	___9	___8	___F
			___-K-
			___-6-
			___J
			___A
			___-8-
			___2
			___W
			___9
			___-B-
			___-F-
			___-4-
			___H
			___7
			___T
			___8
			___-N-
			___-6-
			___-R-
			___P
			___-3-
			___9
			___-5-
			___-W-
			___-M-
			___4
			___-9-
			___-V-
			___-7-
			___X
			___-H-
			___Q
			___-3-
			___9
			___-6-
			___-K-
			___5
			___3
			___X
			___7
			___A
			___-2-
			___-W-

TASK 37: CODING -- LETTER DIGIT

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task you will work with pairs of letters and numbers. Turn to the first page. Look at the boxes above the double line at the top of the page. Look at the letters in the top half of each box. Then, look at the numbers in the bottom half of each box. Each of these letter-number pairs goes together. Each number stands for a letter. In other words, 2 goes with A, 9 goes with B, etc. Now look below the double lines. There are rows of boxes. Here you see the same letters in the top half of the boxes but the numbers are missing from the bottom half of the boxes. Also, the letters in the top half are in mixed-up order. Your job is to write the missing number in the bottom half of each box. You are to write the number which goes with each letter in the top half. Look at the letter in the first box. It's H. What number goes with H? Look up at the top of the page to find out. That's right. The 8 goes with the H. When you begin the task, you will write 8 in the bottom of the box. (Do one or two more items like this. Don't let the subjects write at this point. Emphasize that they can look up at the key at the top of the page as often as necessary to find out which number goes with each letter. Answer all questions, until the subjects understand exactly the nature of their task. Have them work across the page.)

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page.) Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials

A	B	C	D	E	F	G	H	I
2	9	4	1	7	5	3	8	6

H	I	D	H	B	I	H	D	G

D	B	G	B	H	F	D	G	H

A	D	F	G	C	D	C	B	I

G	I	E	A	C	B	F	A	H

D	I	A	H	F	G	H	B	C

H	A	D	E	B	E	C	G	F

E	D	B	A	D	I	F	H	C

I	B	I	C	A	G	E	G	H

TASK 38: CODING--LETTER LETTER

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task you will work with pairs of letters. Turn to the first page. Look at the boxes above the double line at the top of the page. Look at the letter in the top half of each box. And then, look at the letter in the bottom half of each box. Each of these letter-letter pairs goes together. Each letter stands for another letter. In other words, V goes with A, P goes with B, etc. Now look below the double lines. There are rows of boxes. Here you see the same letters in the top half of the boxes but the other letters are missing from the bottom half of these boxes. Also, the letters in the top half are in mixed-up order. Your job is to write the missing letter in the bottom half of each box. You are to write the letter which goes with each letter in the top half. Look at the letter in the first box. It's H. What letter goes with H? Look up at the top of the page to find out. That's right. The Z goes with H. When you begin the task, you will write Z in the bottom of the box. (Do one or two more items like this. Don't let the subjects write at this point. Emphasize that they can look up at the key at the top of the page as often as necessary to find out which letter goes with each other letter. Answer all questions until the subjects understand exactly the nature of their task. Have them work across the page.)

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page.) Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials

A	B	C	D	E	F	G	H	I
V	P	T	M	W	J	K	Z	R

H	I	D	H	B	I	H	D	G

D	B	G	B	H	F	D	G	H

A	D	F	G	C	D	C	B	I

G	I	E	A	C	B	F	A	H

D	I	A	H	F	G	H	B	C

H	A	D	E	B	E	C	G	F

E	D	B	A	D	I	F	H	C

I	B	I	C	A	G	E	G	H

TASK 39: CODING -- LETTER SYMBOL

Procedure and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task you will work with pairs of letters and symbols. Turn to the first page. Look at the boxes above the double line at the top of the page. Look at the letters in the top half of each box. And then, look at the symbols in the bottom half of each box. Each of these letter-symbol pairs goes together. Each symbol stands for a letter. In other words, the lines which make a point to the left go with A, the lines which do not touch go with B, etc.

Now, look below the double lines. There are rows of boxes. Here you see the same letters in the top half of the boxes but the symbols are missing from the bottom half of the boxes. Also, the letters in the top half are in mixed-up order. Your job is to write the missing symbol in the bottom half of each box. You are to write the symbol which goes with each letter. Look at the letter in the first box. It's H. What symbol goes with H? Look up at the top of the page to find out. That's right. The lines which make a point go with A. When you begin the task, you will write lines which make a point in the bottom of the box. (Do one or two more items like this. Do not let the subjects write at this point. ~~Emphasize~~ that they can look up at the key at the top of the page as often as necessary to find out which symbol goes with each letter. Answer all questions until the subjects understand exactly the nature of their task. Have them work across the page.)

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready ? Go.

(After 30 seconds) Stop. Turn the page (to the blank page.) Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials

A	B	C	D	E	F	G	H	I
<	=	x	)	+	1	-	>	✓

H	I	D	H	B	I	H	D	G

D	B	G	B	H	F	D	G	H

A	D	F	G	C	D	C	B	I

G	I	E	A	C	B	F	A	H

D	I	A	H	F	G	H	B	C

H	A	D	E	B	E	C	G	F

E	D	B	A	D	I	F	H	C

I	B	I	C	A	G	E	G	H

TASK 40: CODING--DIGIT LETTER

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task you will work with pairs of numbers and letters. Turn to the first page. Look at the boxes above the double line at the top of the page. Look at the number in the top half of each box. And then, look at the letter in the bottom half of each box. Each of these number--letter pairs goes together. Each letter stands for a number. In other words, D goes with 1, A goes with 2, etc. Now, look below the double lines. There are rows of boxes. Here you see the same numbers in the top half of the boxes but the letters are missing from the bottom half of the boxes. Also, the numbers in the top half are in mixed-up order. Your job is to write the missing letter in the bottom half of each box. You are to write the letter which goes with each number. Look at the number in the first box. It's 8. What letter goes with 8? Look up at the top of the page to find out. That's right. The H goes with 8. When you begin the task, you will write H in the bottom of the box. (Do one or two more items like this. Don't let the subjects write at this point. Emphasize that they can look up at the key at the top of the page as often as necessary to find out which letter goes with each number. Answer all questions until the subjects understand exactly the nature of their task. Have them work across the page.)

Timing. ~~On the next thing.~~ I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page.) Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task material.)

Basic Task Materials

1	2	3	4	5	6	7	8	9
D	A	G	C	F	I	E	H	B

8	6	1	8	9	6	8	1	3

1	9	3	9	8	5	1	3	8

2	1	5	3	4	1	4	9	6

3	6	7	2	4	9	5	2	8

1	6	2	8	5	3	8	9	4

8	2	1	7	9	7	4	3	5

7	1	9	2	1	6	5	8	4

6	9	6	4	2	3	7	3	8

TASK 41: CODING--DIGIT SYMBOL

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task you will work with pairs of numbers and symbols. Turn to the first page. Look at the boxes above the double line at the top of the page. Look at the number in the top half of each box. And then, look at the symbol in the bottom half of each box. Each of these number-symbol pairs goes together. Each symbol stands for a number. In other words, the lines which make a point to the left go with 1, the two lines which do not touch go with 2, etc. Now look below the double lines. There are rows of boxes. Here you see the same number in the top half of the boxes but the symbols are missing from the bottom half of the boxes. Also, the numbers in the top half are in mixed-up order. Your job is to write the missing symbol in the bottom half of each box. You are to write the symbol which goes with each number. Look at the number in the first box. It's 8. What symbol goes with 8? Look up at the top of the page to find out. That's right. The lines which make a point to the right go with 8. When you begin the task, you will write lines which make a point to the right in the bottom of the box. (Do one or two more items like this. Don't let the subjects write at this point. Emphasize that they can look up at the key at the top of the page as often as necessary to find out which symbol goes with each digit. Answer all questions until the subjects understand exactly the nature of their task. Have them work across the page.)

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page.) Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials

1	2	3	4	5	6	7	8	9
<	=	x	)	+	^	-	>	✓

8	6	1	8	9	6	8	1	3

1	9	3	9	8	5	1	3	8

2	1	5	3	4	1	4	9	6

3	6	7	2	4	9	5	2	8

1	6	2	8	5	3	8	9	4

8	2	1	7	9	7	4	3	5

7	1	9	2	1	6	5	8	4

6	9	6	4	2	3	7	3	8

TASK 42: TRUE EQUATIONS--DIGITS

Procedures and Directions

Identification: (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task, you will work with combinations of numbers. Turn to the first page. Look above the double line at the top of the page. Look at the combination of numbers which makes a problem. And then, look at answers which have been written in the blank space. These are combinations which you have seen before and which you know. These are the combinations which make the problem and the answer. In other words, 1 and 1 are 2; 2 and 1 are 3, etc. Now look below the double lines. These are rows of problems. Here you see the same combinations but the answers are missing. Also, the combinations appear in a different order than they did above the line. Your job is to write in the blank space the missing answer to each combination. You are to write the answer which goes with each combination. Look at the first combination or problem. It's 3 and 5. What answer goes with 3 and 5? If you don't know, look up at the top of the page to find out. That's right, 8 is the answer to the combination, 3 and 5. When you begin the task, you will write 8 in the blank space. (Do one or two more items like this. Don't let the subjects write at this point. Emphasize that they can look up at the key at the top of the page as often as necessary to find out which answer goes with each combination or problem. Answer all questions until the subjects understand exactly the nature of their task. Have them work across the page.)

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set): Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page.) Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials

1 and 1 <u>2</u>	2 and 1 <u>3</u>	1 and 3 <u>4</u>	3 and 2 <u>5</u>
2 and 4 <u>6</u>	4 and 3 <u>7</u>	3 and 5 <u>8</u>	5 and 4 <u>9</u>
3 and 5 _____	2 and 4 _____	1 and 1 _____	3 and 5 _____
5 and 4 _____	2 and 4 _____	3 and 5 _____	3 and 2 _____
2 and 1 _____	2 and 4 _____	5 and 4 _____	2 and 1 _____
5 and 4 _____	3 and 5 _____	5 and 2 _____	1 and 3 _____
2 and 1 _____	3 and 5 _____	1 and 1 _____	4 and 3 _____
3 and 2 _____	2 and 1 _____	1 and 3 _____	3 and 5 _____
1 and 3 _____	5 and 4 _____	2 and 4 _____	2 and 1 _____
2 and 4 _____	4 and 3 _____	1 and 1 _____	1 and 3 _____
5 and 4 _____	3 and 2 _____	1 and 1 _____	3 and 5 _____
5 and 4 _____	2 and 4 _____	1 and 1 _____	3 and 5 _____
3 and 2 _____	2 and 1 _____	3 and 5 _____	5 and 4 _____
1 and 3 _____	3 and 5 _____	1 and 1 _____	2 and 4 _____
4 and 3 _____	5 and 4 _____	4 and 3 _____	1 and 3 _____
2 and 1 _____	3 and 2 _____	4 and 3 _____	2 and 1 _____
5 and 4 _____	1 and 1 _____	1 and 3 _____	2 and 4 _____
3 and 2 _____	3 and 5 _____	1 and 3 _____	2 and 4 _____
5 and 4 _____	2 and 4 _____	1 and 3 _____	1 and 1 _____
2 and 1 _____	4 and 3 _____	2 and 1 _____	3 and 5 _____

TASK 43: NONSENSE EQUATIONS--DIGITS

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task, you will work with combinations of numbers. Turn to the first page. Look above the double line at the top of the page. Look at the combination of numbers which makes a problem. And then, look at the answers which have been written in the blank space. These are combinations which you never have seen before and which you don't know. These are new types of problems. Any answer which you might have heard before won't work for these. These are the combinations which make the problem and the answer. In other words, 1 and 1 are 9; 2 and 1 are 4, etc. Now look below the double lines. These are rows of problems. Here you see the same combinations but the answers are missing. Also, the combinations appear in a different order than they did above the line. Your job is to write in the blank space the missing answer to each combination. You are to write the answer which goes with each combination. Look at the first combination or problem. It's 3 and 5. What answer goes with 3 and 5? If you don't know, look up at the top of the page to find out. That's right. 2 is the answer to the combination 3 and 5. When you begin the task, you will write 2 in the blank space. (Do one or two more items like this. ~~Don't let the subjects~~ write at this point. Emphasize that they can look up at the key at the top of the page as often as necessary to find out which answer goes with each combination or problem. Answer all questions until the subjects understand exactly the nature of their task. Have them work across the page.)

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page.) Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials1 and 1 92 and 1 41 and 3 73 and 2 82 and 4 34 and 3 53 and 5 25 and 4 6

3 and 5 _____

2 and 4 _____

1 and 1 _____

3 and 5 _____

5 and 4 _____

2 and 4 _____

3 and 5 _____

3 and 2 _____

2 and 1 _____

2 and 4 _____

5 and 4 _____

2 and 1 _____

5 and 4 _____

3 and 5 _____

3 and 2 _____

1 and 3 _____

2 and 1 _____

3 and 5 _____

1 and 1 _____

4 and 3 _____

3 and 2 _____

2 and 1 _____

1 and 3 _____

3 and 5 _____

1 and 3 _____

5 and 4 _____

2 and 4 _____

2 and 1 _____

2 and 4 _____

4 and 3 _____

1 and 1 _____

1 and 3 _____

5 and 4 _____

3 and 2 _____

1 and 1 _____

3 and 5 _____

5 and 4 _____

2 and 4 _____

1 and 1 _____

3 and 5 _____

3 and 2 _____

2 and 1 _____

3 and 5 _____

5 and 4 _____

1 and 3 _____

3 and 5 _____

1 and 1 _____

2 and 4 _____

4 and 3 _____

5 and 4 _____

4 and 3 _____

1 and 3 _____

2 and 1 _____

3 and 2 _____

4 and 3 _____

2 and 1 _____

5 and 4 _____

1 and 1 _____

1 and 3 _____

2 and 4 _____

3 and 2 _____

3 and 5 _____

1 and 3 _____

2 and 4 _____

5 and 4 _____

3 and 5 _____

1 and 3 _____

1 and 1 _____

2 and 1 _____

4 and 3 _____

2 and 1 _____

3 and 5 _____

TASK 44: NONSENSE EQUATIONS--LETTERS

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task, you will work with combinations of letters. Turn to the first page. Look at the combination of letters which makes a problem. And then, look at the answers which have been written in the blank space. These are combinations which you never have seen before and which you don't know. These are new types of problems. Any answers which you might have learned before won't work for these. These are the combinations which make the problem and the answer. In other words D and D are B; A and D are C, etc. Now look below the double lines. These are rows of problems. Here you see the same combinations but the answers are missing. Also, the combinations appear in a different order than they did above the line. Your job is to write in the blank space the missing answer to each combination. You are to write the answer which goes with each combination or problem. Look at the first combination or problem. It's G and F. If you don't know the answer, look up at the top of the page to find out. That's right, A is the answer to the combination, G and F. When you begin the task, you will write A in the blank space. (Do one or two more items like this. Don't let the subjects write at this point. Emphasize that they can look up at the key at the top of the page as often as necessary to find out which answer goes with each combination or problem. Answer all questions, until the subjects understand exactly the nature of their task. Have them work across the page.)

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page.) Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of each trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Takk MaterialsD and D BA and D CD and G EG and A HA and C GC and G FG and F AF and C I

G and F _____

A and G _____

D and D _____

G and F _____

F and C _____

A and C _____

C and F _____

G and A _____

A and D _____

A and C _____

F and C _____

A and D _____

F and C _____

G and F _____

G and A _____

D and G _____

A and D _____

G and F _____

D and D _____

C and G _____

G and A _____

A and D _____

D and G _____

G and F _____

D and G _____

F and C _____

A and C _____

A and D _____

A and C _____

C and G _____

D and D _____

D and G _____

F and C _____

G and A _____

D and D _____

G and F _____

F and C _____

A and C _____

D and D _____

G and F _____

G and A _____

A and D _____

G and F _____

F and C _____

D and G _____

G and F _____

D and D _____

A and C _____

C and G _____

F and C _____

C and G _____

D and G _____

A and D _____

G and A _____

C and G _____

A and D _____

F and C _____

D and D _____

D and G _____

A and C _____

G and A _____

G and F _____

D and G _____

A and C _____

F and G _____

A and C _____

D and G _____

D and D _____

A and D _____

C and G _____

A and D _____

G and F _____

TASK 45: NONSENSE EQUATIONS--SYMBOLS

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In the task, you will work with combinations of symbols. Turn to the first page. Look at the combination of symbols which makes a problem. And then, look at the answers which have been written in the blank space. These are combinations which you have never seen before and which you don't know. These are new types of problems. Any answers which you might have learned before won't work for these. These are the combinations which make the problem and the answer. In other words, $<$ and $<$ are $\sqrt{}$; $-$ and $<$ and $)$, etc. Now look below the double lines. These are rows of problems. Here you see the same combinations but the answers are missing. Also the combinations appear in a different order than they did above the line. Your job is to write in the blank space the missing answer to each combination or problem. Look at the first combination or problem. It's X and +. What answer goes with X and +? If you don't know, look up at the top of the page to find out. That's right. $=$ is the answer to the combination, X and +. When you begin the task, you will write $=$ in the blank space. (Do one or two more items like this.) Don't let the subject write at this point. Emphasize that they can look up at the key at the top of the page as often as necessary to find out which answer goes with each combination or problem. Answer all questions until the subjects understand exactly the nature of their task. Have them work across the page.)

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page.)
Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trials 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials

< and < <u>✓</u>	= and < <u>)</u>	< and X <u>-</u>	X and = <u>></u>
= and) <u>X</u>	) and X <u>+</u>	X and + <u>=</u>	+ and) <u>^</u>

X and + _____	= and) _____	< and < _____	X and + _____
+ and) _____	= and) _____	X and + _____	X and = _____
= and < _____	= and) _____	+ and) _____	= and < _____
+ and) _____	X and + _____	X and = _____	< and X _____
= and < _____	X and + _____	< and < _____	) and X _____
X and = _____	= and < _____	< and X _____	X and + _____
< and X _____	+ and) _____	= and) _____	= and < _____
= and) _____	) and X _____	< and < _____	< and X _____
+ and) _____	X and = _____	< and < _____	X and + _____
+ and) _____	= and) _____	< and < _____	X and + _____
X and = _____	= and < _____	> and + _____	✓ and) _____
< and X _____	X and + _____	< and < _____	= and) _____
) and X _____	+ and) _____	) and X _____	< and X _____
= and < _____	X and = _____	) and X _____	= and < _____
+ and) _____	< and < _____	< and X _____	= and ^ _____
X and = _____	X and + _____	< and X _____	= and) _____
+ and) _____	= and) _____	< and X _____	< and < _____
= and < _____	) and X _____	= and < _____	X and + _____

TASK 46: TRUE EQUATIONS--DIGIT LETTER

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of the task activity. In the task, you will work with combinations of letters and numbers. Turn to the first page. Look at the boxes above the double line at the top of the page. Look at the number in the top half of each box. And then, look at the letter in the bottom half of each box. Each of these number-letter pairs goes together. Each letter stands for a number. In other words, D goes with 1, A goes with 2, etc. Now look below the double line. These are rows of problems. Here you see combinations of letters with the answer missing. Your job is to write in the blank space the missing answer to each combination or problem. Look at the first combination or problem.. It's G and F. What answer goes with G and F? If you don't know, look up at the top of the page to find out. The number which goes with G is 3. The number which goes with F is 5. 3 and 5 are 8. H is 8. Therefore, H is the answer to the combination G and F. When you begin the task, you will write H in the blank space. (Do one or two more items like this. Don't let the subjects write at this point. Emphasize that they can look up at the key at the top of the page as often as necessary to find out which answer goes with each combination or problem. Answer all questions until the subjects understand exactly the nature of their task. Have them work across the page.)

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page.) Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trial 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials

1	2	3	4	5	6	7	8	9
D	A	G	C	F	I	E	H	B

G and F _____	A and C _____	D and D _____	G and F _____
F and C _____	A and C _____	C and F _____	G and A _____
A and D _____	A and C _____	F and C _____	A and D _____
F and C _____	G and F _____	G and A _____	D and G _____
A and D _____	G and F _____	D and D _____	C and G _____
G and A _____	A and D _____	D and G _____	G and F _____
D and G _____	F and C _____	A and C _____	A and D _____
A and C _____	C and G _____	D and D _____	D and C _____
F and C _____	G and A _____	D and D _____	G and F _____
F and C _____	A and C _____	D and D _____	G and F _____
G and A _____	A and D _____	G and F _____	F and C _____
D and G _____	G and F _____	D and D _____	A and C _____
C and G _____	F and C _____	C and G _____	D and G _____
A and D _____	G and A _____	C and G _____	A and D _____
F and C _____	D and D _____	D and G _____	A and C _____
G and A _____	G and F _____	D and G _____	A and C _____
F and C _____	A and C _____	D and G _____	D and D _____
A and D _____	C and G _____	A and D _____	G and F _____

TASK 47: TRUE EQUATIONS--DIGIT SYMBOL

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In the task, you will work with combinations of symbols and numbers. Turn to the first page. Look at the boxes above the double line at the top of the page. Look at the number in the top half of each box. And then look at the symbol in the bottom half of each box. Each of these number-symbol pairs goes together. Each symbol stands for a number. In other words < goes with 1, = goes with 2, etc. Now look below the double line. These are rows of problems. Here you see combinations of symbols with the answers missing. Your job is to write in the blank space the missing answer to each combination or problem. Look at the first combination or problem. It's X and +. What answer goes with X and +? If you don't know, look up at the top of the page to find out. The number which goes with X is 3. The number which goes with + is 5. 3 and 5 are 8. > is 8. Therefore, > is the answer to the combination X and +. When you begin the task, you will write > in the blank space. (Do one or two more items like this. Don't let the subjects write at this point. Emphasize that they can look up at the key at the top of the page as often as necessary to find out which answer goes with each combination or problem. Answer all questions until the subjects understand exactly the nature of their task. Have them work across the page.)

Timing. One more thing. I'm going to keep time. You have 30 seconds to work on this page. So work fast. You can't finish the whole page. Nobody could because we have more here than anyone can do in 30 seconds. But do as many as you can and do them right. The more you do right, the higher your score will be.

Trial 1. (Speed and accuracy set) Remember. Work fast and accurately. Ready? Go.

(After 30 seconds) Stop. Turn the page (to the blank page.) Now, put your pencil down and rest. (Allow 30 seconds rest.)

Trial 2 through 6. Get your pencils ready and turn the page. (Repeat speed and accuracy set.)

(Continue this process for the remaining five trials. Use intermittent reinforcement when it seems appropriate. Be sure to give the speed and accuracy set at the beginning of each trial and rest 30 seconds at the end of the trial. Reiterate any part of the explanation necessary. Reassure the subjects several times that no one could do the entire page in 30 seconds.)

Administrative Sequence. (Use the basic task materials in the exact form which is presented below for each of the six trials. A blank page appears between each page of task materials.)

Basic Task Materials

1	2	3	4	5	6	7	8	9
<	=	X	)	+	^	-	>	✓

X and + _____	= and) _____	< and < _____	X and + _____
+ and) _____	X and + _____	X and + _____	X and = _____
= and < _____	= and) _____	+ and) _____	= and < _____
+ and) _____	= and) _____	X and = _____	< and X _____
= and < _____	X and + _____	< and < _____	) and X _____
X and = _____	= and < _____	< and X _____	X and + _____
< and X _____	+ and) _____	= and) _____	= and < _____
= and) _____	) and X _____	< and < _____	< and X _____
+ and) _____	X and = _____	< and < _____	X and + _____
+ and) _____	= and) _____	< and < _____	X and + _____
X and = _____	= and < _____	X and + _____	✓ and) _____
< and X _____	X and + _____	< and < _____	= and) _____
) and X _____	+ and) _____	< and X _____	< and X _____
= and < _____	X and = _____	) and X _____	= and < _____
+ and) _____	< and < _____	< and X _____	= and ^ _____
X and = _____	X and + _____	) and X _____	= and) _____
+ and) _____	= and) _____	< and X _____	< and < _____
= and < _____	) and X _____	= and < _____	X and + _____

**TASK 48: SARASON: TEST ANXIETY SCALE FOR CHILDREN (TASC) AND
GENERAL ANXIETY SCALE FOR CHILDREN (GASC)**

The directions, procedures, and materials used for this task were those presented by Sarason, et. al. (1960, pp. 306-310).

TASK 49: VOCABULARY I (BASE CELLS 1-6)

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of the task activity. In this task you will work with word families. Turn to the first page. Look at the words on the left hand side of the page which are underlined. These are the names of some word families. Look at the four words under each word family name. These are possible members of the word family. There may be one or more correct answers in each line. These are words which you have seen before. Your job is to circle any of the four words which you think go in the word family name. These are the steps we will follow. I will read the word family name and the four words which are possible family members. You circle the word or words that you think are the right answers; i.e., the members of the word family.

Timing. One more thing. You have to work fast since you have only a few seconds for each item. Keep up and do the best you can. (No example is given to subjects for this task. Watch carefully on the first items to be sure that subjects know what to do. Read the stimulus material at one-second rate. Allow two seconds for response.)

Task Administration. (Speed and accuracy set) Remember, work fast and accurately. Ready? Go. (Administer the entire set of task materials to the subjects without stopping.)

Basic Task Materials

1. j:
jul taw yoz jic
2. transportation:
leech airplane eighth golfer
3. humans:
yesterday hand dragonfly trolley
4. f:
bat shop fort lumber
5. time:
apple minute grasshopper decade
6. b:
lantern blackberry freezer scale
7. fruit:
orange mother tomorrow lime
8. invertebrate animals:
buoy hornet grandfather quart
9. y:
mig yax jor yuj
10. insect:
evening weevil scorpion cousin
11. measurement:
doctor third rocket snail
12. family:
grandson banana brother termite
13. s:
fence list book shadow
14. t:
tis jah tem mot

15. j:

toj

jos

mez

jad

16. insect:

mosquito

day

avocado

gnat

17. invertebrate animals:

barge

man

lobster

noon

18. family:

uncle

summer

pineapple

daughter

19. b:

shell

fairground

bucket

lad

20. measurement:

dozen

subway

farmer

earthworm

21. time:

grandmother

second

autumn

bumblebee

22. y:

yov

jum

yeb

mox

23. transportation:

gentleman

tick

pint

bicycle

24. s:

barber

light

feather

sapphire

25. m:

tuh

mab

mus

yub

26. fruit:

grape

plum

stepbrother

centipede

27. l:

fountain

seesaw

log

bell

28. humans:

crab

first

beacon

nurse

29. family:

apricot baby cricket nephew

30. measurement:

dirigible inch nose firefly

31. invertebrate animals:

oyster girl truck pound

32. insect:

sister chigger cockroach morning

33. t:

towel teflon macaroni taz

34. humans:

bushel starfish elbow canoe

35. f:

button field signal lock

36. transportation:

submarine century butterfly fisherman

37. fruit:

tangerine midnight wife grapefruit

38. measurement:

helicopter swimmer caterpillar ounce

39. time:

month beetle winter cherry

40. insect:

lemon housefly father wasp

41. humans:

automobile octopus woman mile

42. time:

year niece afternoon peach

TASK 50: VOCABULARY II (BASE CELLS 7-12)

Procedures and Directions

Identification. (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task you will work with word families. Turn to the first page. Look at the words on the left hand side of the page which are underlined. These are the names of some word families. Look at the four words under each word family name. These are possible members of the word family. There may be one or more correct answers in each line. These are words which you have seen before. Your job is to circle any of the four words which you think go in that word family named. These are the steps we will follow. I will read the word family name and the four words which are possible family members. You circle the word or words that you think are the right answers; i.e., the members of the word family.

Timing. One more thing. You have to work fast since you have only a few seconds for each item. Keep up and do the best you can.

(No example is given to subjects for this task. Watch carefully on the first time to be sure that subjects know what to do. Read the stimulus material at one second rate. Allow two seconds for response.)

Task administration. (Speed and accuracy set) Remember, to work fast and accurately. Ready? Go. (Administer the entire set of task materials to the subjects without stopping.)

Basic Task Materials1. vertebrate animals:

salmon	river	petunia	frog
--------	-------	---------	------

2. v:

gim	kel	vac	zom
-----	-----	-----	-----

3. plants:

vase	boxwood	hawk	alfalfa
------	---------	------	---------

4. trees:

pine	typhoon	carnation	ape
------	---------	-----------	-----

5. household:

mountain	refrigerator	dish	holly
----------	--------------	------	-------

6. weather

lightning	orchid	rabbit	chestnut
-----------	--------	--------	----------

7. r:

pebble	rodeo	record	desert
--------	-------	--------	--------

8. earth features:

moon	alligator	clay	bed
------	-----------	------	-----

9. p:

window	platform	rhyme	pearl
--------	----------	-------	-------

10. flowers:

jonquil	tiger	birch	sleet
---------	-------	-------	-------

11. k:

kaz	vod	zer	gub
-----	-----	-----	-----

12. earth features:

cedar	snow	valley	robin
-------	------	--------	-------

13. w:
 wire paint diamond war
14. mammals:
 wolf maple blizzard lily
15. weather:
 geranium cloudburst willow beaver
16. plants:
 rose cloud oats desk
17. vertebrate animals:
 mud shark toaster lizard
18. p:
 post wool pickax rifle
19. flowers:
 mist zebra daisy elm
20. z:
 veb zut goc kif
21. weather:
 squirrel mimosa crocus drought
22. k:
 giz zeg vup koj
23. household:
 oak napkin monkey quilt
24. d:
 door peg dust race
25. trees:
 sweetgum humidity kangaroo aster

26. g:

ven	zpp	kuv	gid
-----	-----	-----	-----

27. mammals:

fox	hurricane	magnolia	dahlia
-----	-----------	----------	--------

28. plants:

violet	turtle	ivy	cup
--------	--------	-----	-----

29. trees:

spruce	goldenrod	cow	haze
--------	-----------	-----	------

30. vertebrate animals:

trout	clover	ocean	dog
-------	--------	-------	-----

31. v:

zun	gef	vil	kaq
-----	-----	-----	-----

32. flowers:

giraffe	whirlwind	dandelion	chinaberry
---------	-----------	-----------	------------

33. household:

thunder	pillow	rug	honeysuckle
---------	--------	-----	-------------

34. mammals:

nasturtium	pecan	fog	horse
------------	-------	-----	-------

35. w:

whistle	paper	rope	wood
---------	-------	------	------

36. earth features:

minnow	hill	sofa	rainbow
--------	------	------	---------

37. vertebrate animals:

lake	python	chair	owl
------	--------	-------	-----

38. flowers:

cypress	tornado	zinnia	cat
---------	---------	--------	-----

39. r:

paddle	razor	ring	dagger
--------	-------	------	--------

40. plants:

lamp	hickory	marigold	dirt
------	---------	----------	------

41. z:

kip	vuz	gak	zev
-----	-----	-----	-----

42. weather:

frost	poppy	elephant	sycamore
-------	-------	----------	----------

TASK 51: DIGIT RECALL I (BASE CELLS 1-6)

Procedures and Directions

Identification: (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task you will work with lists of numbers. I'll read the list four times. Your job is to listen carefully and write the numbers down that I say. They do not have to be in any particular order--just so you write down as many as you can of the numbers I say. We will do this four times for each list. That is, I'll read the list of numbers, you'll write them down. Then, I'll read the list again, and you write them down. Then, we'll do it two more times. Listen carefully, because every time I read the list the numbers in it will be in a different order. We'll do this for six lists of numbers. The lengths of some of these lists will be different, but each one will be presented four times and the numbers will be mixed up each time. Turn to the first page. I am going to call out some numbers. Your job is to write as many as you can remember on this page. Then turn the page and I will call out some more. Each time write as many as you can. To keep the numbers separate, spread them out on the page. These are the steps we will follow. I will read the numbers. Do not start until I'm through reading the list. You write as many of them as you can on the page. Then, I'll say "Stop". At this time you stop and put your pencil down. Then turn this page and listen for the second reading of the list of numbers. Then pick up your pencil and write these. (No example is given to the subjects for this task. Watch carefully on the first items to be sure that the subjects know what to do.)

Timing. You have to work fast since you have only a second for each number in the list. Keep up and do the best you can. But if you don't get them all right--don't worry because nobody can get all of the numbers right. Some of them will be long and hard, some of them will be short and easy. So do your best and don't get upset.

Task administration. (Speed and accuracy set) Remember, to work fast and accurately. Ready? Go. (Administer the entire set of materials to the subjects without stopping. Read at one second rate. Allow one second per number for response time. Watch the subjects and be sure to alleviate any anxiety which may arise. Also be sure they don't start writing until the entire list is read. Keep the task moving and allow subject no extra time. Be sure that all work on the right page. Be sure subjects put their pencils down between reading. Before reading a list, tell the subjects how many items there are in the list.)

Basic Task Materials

1. List corresponding to CF-2L

1st reading: 37, 82, 13, 51
2nd reading: 82, 51, 37, 13
3rd reading: 51, 37, 13, 82
4th reading: 13, 37, 51, 82

2. List corresponding to RL-OL

1st reading: 17, 26, 52, 79
2nd reading: 26, 79, 17, 52
3rd reading: 79, 17, 52, 26
4th reading: 52, 26, 79, 17

3. List corresponding to PS-NS

1st reading: 83, 32, 78, 54
2nd reading: 54, 83, 32, 78
3rd reading: 78, 54, 83, 32
4th reading: 32, 78, 54, 83

4. List corresponding to RL-2L

1st reading: 27, 96, 39, 57, 14, 93, 42, 73, 29, 85, 18, 61
2nd reading: 93, 14, 73, 18, 85, 96, 57, 27, 39, 42, 61, 29
3rd reading: 85, 18, 27, 42, 29, 96, 57, 73, 93, 61, 14, 39
4th reading: 42, 57, 61, 93, 73, 39, 29, 14, 18, 27, 85, 96

5. List corresponding to PS-1L

1st reading: 89, 94, 63, 46
2nd reading: 46, 63, 94, 89
3rd reading: 94, 46, 89, 63
4th reading: 63, 89, 46, 94

6. List corresponding to CF-OL

1st reading: 87, 19, 53, 68
2nd reading: 53, 87, 68, 19
3rd reading: 68, 53, 19, 87
4th reading: 19, 68, 87, 53

TASK 52: DIGIT RECALL II (BASE CELLS 7-12)

Procedures and Directions

Identification: (Have the subjects fill in identifying information in the appropriate places on the booklet cover sheet.)

Description of task activity. In this task you will work with lists of numbers. I'll read the list four times. Your job is to listen carefully and write the numbers down that I say. They do not have to be in any particular order--just so you write down as many as you can of the numbers I say. We will do this four times for each list. That is, I'll read the list of numbers. You'll write them down. Then, I'll read the list again, and you write them down. Then we'll do it two more times. Listen carefully, because every time I read the list the numbers in it will be in a different order.

We'll do this for six lists of numbers. The lengths of some of these lists will be different, but each one will be presented four times and the numbers will be mixed up each time. Turn to the first page, I am going to call out some numbers. Your job is to write as many as you can remember on this page. Then turn the page and I will call out some more, etc. Each time write as many as you can. To keep the numbers separate spread them out on the page. These are the steps we will follow. I will read the numbers. Do not start to write until I'm through reading the list. You write as many of them as you can on the page. Then, I'll say "stop". At this time you stop and put your pencil down. Then turn this page and listen for the second reading of the list of numbers. Then pick up your pencil and write these. (No example is given to the subjects for this task. Watch carefully on the first items to be sure that the subjects know what to do.)

Timing. You have to work fast since you have only a second for each number in the list. Keep up and do the best you can. But if you don't get them all right, don't worry because nobody can get all of the numbers right. Some of them will be long and hard, some of them will be short and easy. So do your best and don't get upset.

Task administration. (Speed and accuracy set) Remember, to work fast and accurately. Ready? Go. (Administer the entire set of materials to the subjects without stopping. Read at a one-second rate. Allow one second per number for response time. Watch the subjects and be sure to alleviate any anxiety which may arise. Also be sure they don't start writing until the entire list is read. Keep the task moving and allow subject no extra time. Be sure that all work on the right page. Be sure subjects put their pencils down between readings. Before reading a list, tell the subjects how many items there are in the list.)

Basic Task Materials

1. List corresponding to CF-1L

1st reading: 28, 75, 91, 47
2nd reading: 91, 28, 47, 75
3rd reading: 47, 75, 28, 91
4th reading: 75, 47, 91, 28

2. List corresponding to RL-NS

1st reading: 59, 86, 24, 98, 71, 62, 15, 43
2nd reading: 98, 15, 86, 43, 24, 62, 59, 71
3rd reading: 62, 24, 43, 59, 86, 71, 98, 15
4th reading: 86, 71, 59, 43, 62, 98, 15, 24

3. List corresponding to PS-OL

1st reading: 31, 56, 25, 97
2nd reading: 25, 97, 31, 56
3rd reading: 97, 25, 56, 31
4th reading: 56, 31, 97, 25

4. List corresponding to RL-1L

1st reading: 72, 37, 81, 16, 95, 58, 23, 49
2nd reading: 81, 23, 49, 58, 72, 16, 37, 95
3rd reading: 58, 81, 95, 37, 49, 23, 72, 16
4th reading: 16, 23, 72, 58, 95, 81, 49, 37

5. List corresponding to PS-2L

1st reading: 69, 45, 38, 74
2nd reading: 38, 69, 74, 45
3rd reading: 45, 74, 38, 69
4th reading: 74, 45, 69, 38

6. List corresponding to CF-NS

1st reading: 92, 35, 76, 41
2nd reading: 76, 41, 92, 35
3rd reading: 41, 76, 35, 92
4th reading: 35, 92, 41, 76

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APPENDIX F

TASK ADMINISTRATION VARIABLES--METHOD OF APPROACH TO THE MATERIAL
AND TYPE OF PRESENTATION OF THE MATERIAL: PROCEDURES AND DIRECTIONS

Method of Approach to the Material

Induction

Rote Learning

Here are the steps we'll follow as we do the task.

1. I'll read the word part of the word-number pairs.
2. In the first blank space, you write the number which goes with the word to make a word-number pair. If you don't know the number, draw a line through the blank space.
3. I'll read the word part of the pair again and the number which goes with it to make a pair.
4. You write this number in the second blank space. Then, check to see how it agrees with what you wrote in the first blank space.
5. Remember, you won't know many at first, but pretty soon you will begin to know the word-number pairs and then you will know the number part of each word number pair.

Concept Formation

Here are the steps we'll follow as we do the task.

1. I'll read the word which is a family member.
2. In the first blank space, you write the number name of the word family to which this word belongs. If you don't know the number, draw a line through the blank space.
3. I'll read the word which is the family member again and the number name which goes with it.
4. You write this down in the second blank space. Then, check to see how it agrees with what you wrote in the first blank space.
5. Remember, you won't know many at first, but pretty soon you will begin to know the family names and then you will know the number name of each family member.

Problem Solving

Here are the steps we'll follow as we do the task.

1. I'll read four words which are members of several word families. Among these are two words which are members of the same word family and two words which are members of different word families.

2. After I read the first two words, you write a number name that goes with one of these words in the first blank space. After I read the second two words, you write the number name that goes with one of these words in the second blank space.
3. I'll read the four words which are members of several word families. And I'll read the number name which goes with two of these words. This same number name should be in the first and second blank spaces.
4. You write this number name in the third blank space. Then, check to see how it agrees with what you wrote in the first and second blank spaces.
5. You figure out how to use the rule which tells you which members of the word family this number-name goes with, so you can find the word families which go with the four number names you are given.
6. Remember, you won't know many at first, but pretty soon you will begin to use the rule to give the right number names to the members of the word families.

Deduction

Rote Learning

Here are the steps we'll follow as we do the task.

1. I'll read the word-number pairs.
2. Then, I'll read each word part of each word-number pair.
3. In the first blank space, you write the number which goes with the word to make a word-number pair. If you don't know the number, draw a line through the blank space.
4. I'll read the word part of the pair again and the number which goes with it to make a pair.
5. You can write this down in the second blank space. Then, check to see how it agrees with what you wrote in the first blank space.
6. Remember, you won't know many at first, but pretty soon you will begin to know the word-number pairs and then you will know the number part of each word-number pair.

Concept Formation

Here are the steps we'll follow as we do the task.

1. I'll read the word families and their number names.

2. Then, I'll read each word which is a family member.
3. In the first blank space, you write the number name of the word family to which this word belongs. If you don't know the number name, draw a line through the blank space.
4. I'll read the word which is the family member again and the number name which goes with it.
5. You write this down in the second blank space. Then, check to see how it agrees with what you wrote in the first blank space,
6. Remember, you won't know many at first, but pretty soon you will begin to know family names and then you will know the number names of each family member.

Problem Solving

Here are the steps we'll follow as we do the tasks.

1. I'll read the rule and an example of how it applies.
2. Then, I'll read four words which are members of several word families. Among these are two words which are members of the same word families and two words which are members of two different word families.
3. After I read the first two words, you write the number name that goes with one of these words in the first blank space. After I read the second two words, you write the number name that goes with one of these words in the second blank space.
4. I'll read the four words which are members of several word families. And I'll read the number which goes with two of these words. This same number name should be in the first and second blank spaces.
5. You write this number name in the third blank space. Then, check to see how it agrees with what you wrote in the first and second blank spaces.
6. You figure out how to use the rule which tells you which members of the word families this number name goes with, so you can find the word families which go with the four number names you are given.
7. You won't know many at first but pretty soon you will begin to use the rule to give the right number names to the members of the word families.

Demonstration

Rote Learning

Here are the steps we'll follow as we do the task.

1. I'll read the word part of the pair and the number which goes with it to make a pair.
2. You write this number part of the pair in the first blank space.
3. Then, I'll read the word part of the pair again.
4. In the second blank space, you write the number which goes with the word to make a word-number pair. Then, check to see how it agrees with what you wrote in the first blank space.
5. Remember, you won't know many at first but pretty soon you will begin to know the word-number pairs and then you will know the number part of each word number pair.

Concept Formation

Here are the steps we'll follow as we do the task.

1. I'll read the word which is a family member and the number name which goes with it.
2. You write this number name in the first blank space.
3. Then, I'll read the word which is the family member again.
4. In the second blank space, you write the number name of the word family to which this word belongs. Then, check to see how it agrees with what you wrote in the first blank space.
5. Remember, you won't know many at first but pretty soon you will begin to know the family names and then you will know the number names of each family member.

Problem Solving

Here are the steps we'll follow as we do the task.

1. I'll read four words which are members of several word families. Among these are two words which are members of the same word family and two words which are members of two different word families.
2. After I read the first two words, I'll read the number name which goes with one of these words and you write it in the first blank space. After I read the second two words, I'll read the number name which goes with one of these words and you write it in the second blank space.

3. I'll read the four words which are members of several families.
4. In the third blank space, you write the number name which goes with two of these words. This same number name should be in the first and second blank spaces. Then, check to see how it agrees with what you wrote in the first and second blank spaces.
5. You figure out how to use the rule which tells you which members of the word families this number name goes with, so you can find the word families which go with the four number names you are given.
6. Remember, you won't know many at first but pretty soon you will begin to use the rule to give the right number names to the members of the word families.

Type of Presentation of the Material

Oral

In this task booklet, you will see blank spaces to write the number names but you will not see the words written. You listen carefully to the words as I say them.

On the test list, you will see the words written and blank spaces for you to write the numbers in.

Remember, any time you don't know an answer, draw a line through the blank space.

Now, let's do the first trial.

Oral-Visual

In this task booklet, you will see the words written and blank spaces to write the number names. You look at and listen carefully to the words as I say them.

On the test lists, you also will see the words written and blank spaces for you to write the numbers in.

Remember, any time you don't know the answer, mark a line through the blank space.

Now, let's do the first trial.

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APPENDIX G

EXAMPLE OF ADMINISTRATION BOOK:
CF-1L-DIRECT LEARNING--DEDUCTION VARIANT

For tasks after the first, to minimize negative transfer

Now, let's begin the new task. Listen carefully to one important thing. You have had other tasks which might have looked like this one we are about to do. But they were different from this task. If you try to answer exactly the same way you did on the others, you'll have trouble and get things wrong. This is a new task. Listen carefully to the directions so you'll know what you are suppose to do and how you are supposed to do it.

(N.B. At any time throughout the task, when it seems necessary, reiterate the directions to help the subjects to understand how to do the task.)

(Also

Watch for any signs of anxiety and reassure the subjects

- 1) that nobody can learn it all,
- 2) that it has no effect on grades, etc.,
- 3) that they should work hard,
- 4) that they are doing a good job.)

Introduction to Concept Formation Tasks

In this task, you will work with word families. You know what a family is. A family is a number of things which go together in some way. All of the family members may be different in some ways, but they are all alike in some ways--that is what makes them a family. For example, red, green, and blue are members of the same word family. They are all colors. We have given the families in this task--numbers for names. You'll find the right answers when you learn the number names which go with the word families.

Your job is to learn the number names of four different word families and to remember them so that you can apply the right number name when any member of any of the four word families is presented to you.

Before we begin the task, there are several things I want to tell you.

(Use the appropriate alternate.)

1. (Tasks composed of nonsense syllables:) The words are kind of funny little words. They are not hard to say, but they probably are different from any words you've seen or heard before.

OR

1. (Tasks composed of words:) These words are common words which you've seen and heard before.
-
-

2. Remember: There are many different ways that words can be grouped to make a word family. If you try one way and it doesn't work, try another way.
3. I'm going to watch the time very closely. You will have only two seconds to write the number. So, work quickly.
4. But work carefully and do a good job because after you put in the answers for a few, we'll have a test to see how much you have learned.
5. Also, in addition to the tests I give you today to find out how much you learn, you will be tested on this same material next week to see how much you remember over the period of a week. So learn as much as you can today. But don't worry about the test. And don't try to practice or study for it. You couldn't if you wanted to. It won't have any effect on your grades or work in class. It just helps us know more about how people learn. So just work hard and don't worry.

Concept Formation Tasks: Procedure for Deduction Variant

Here are the steps we'll follow as we do the task.

1. I'll read the word families and their number names.
2. Then, I'll read each word which is a family member.
3. In the first blank space, you write the number name of the word family to which this word belongs. If you don't know the number name, draw a line through the blank space.
4. I'll read the word which is the family member again and the number name which goes with it.
5. You write this down in the second blank space. Then, check to see how it agrees with what you wrote in the first blank space.
6. Remember, you won't know many at first, but pretty soon you will begin to know family names and then you will know the number names of each family member.

Concept Formation Tasks: Restatement of Required Activity and Presentation of Clue

1. Remember what your job is: to learn the number name of each of the four word families and remember them so you can apply the right number when any member of any of the four word families is presented to you.
2. Listen carefully and I'll give you a clue which will help you. When one member of a word family has a number name, the other members of the same word family will have the same number name and members of different word families never will have this number name.

Distribution of Materials

(Hand out task booklets.) Here are the task booklets. Look at the first page. Fill in the blanks with the information I ask for. (Read each of the items--name, grade, teacher--in turn, and wait until the subjects fill in the appropriate blanks.)

NAME _____

GRADE _____

TEACHER _____

Test Scores

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Procedure for the Type of Presentation Variants

(Use the appropriate alternate.)

Oral Variant

In this task booklet, you will see blank spaces to write the number names but you will not see the words written. You listen carefully to the words as I say them.

On the test lists, you will see the words written and blank spaces for you to write the numbers in.

Remember, any time you don't know an answer, draw a line through the blank space.

Now, let's do the first trial.

or

Oral-Visual Variant

In this task booklet, you will see the words written and blank spaces to write the number names. You look at and listen carefully to the words as I say them.

On the test lists, you also will see the words written and blank spaces for you to write the numbers in.

Remember, any time you don't know an answer, mark a line through the blank space.

Now, let's do the first trial.

First, I'll read the words which are members of the word families.

1. Weather words are 75
2. Tree words are 28
3. Flower words are 91
4. Mammal words are 47

(As you go through trial 1 with the subjects, reiterate the basic points of the directions as the various steps are taken. Here, and at any time subsequently during the task administration, recapitulate any parts of the directions necessary: e.g., the nature of the task; the clue, the steps, etc. Work with the subjects until they thoroughly understand how to do the task. Also, watch for signs of anxiety and reassure the subjects when indicated.)

Task Materials: CF--1LTrial List 1

- | | |
|--------------------|-----------------|
| 1. pine _____ | pine _____ |
| 2. typhoon _____ | typhoon _____ |
| 3. carnation _____ | carnation _____ |
| 4. ape _____ | ape _____ |
| 5. lightning _____ | lightning _____ |
| 6. orchid _____ | orchid _____ |
| 7. rabbit _____ | rabbit _____ |
| 8. chestnut _____ | chestnut _____ |

"Now, let's have a test to see how much you have learned."

Test List

1. cypress _____
2. tornado _____
3. zinnia _____
4. cat _____
5. frost _____
6. poppy _____
7. elephant _____
8. sycamore _____

Generalization:

1. Weather words are 75
2. Tree words are 28
3. Flower words are 91
4. Mammal words are 47

Task Materials: CF--1L (continued)

Trial List 2

- | | |
|-------------------|----------------|
| 1. jonquil _____ | jonquil _____ |
| 2. tiger _____ | tiger _____ |
| 3. birch _____ | birch _____ |
| 4. sleet _____ | sleet _____ |
| 5. wolf _____ | wolf _____ |
| 6. maple _____ | maple _____ |
| 7. blizzard _____ | blizzard _____ |
| 8. lily _____ | lily _____ |

"Now, let's have a test to see how much you have learned."

Test List

1. cypress _____
2. tornado _____
3. zinnia _____
4. cat _____
5. frost _____
6. poppy _____
7. elephant _____
8. sycamore _____

Generalization:

1. Weather words are 75
2. Tree words are 28
3. Flower words are 91
4. Mammal words are 47

Task Materials: CF - 1L (continued)

Trial List 3

- | | |
|---------------------|------------------|
| 1. geranium _____ | geranium _____ |
| 2. cloudburst _____ | cloudburst _____ |
| 3. willow _____ | willow _____ |
| 4. beaver _____ | beaver _____ |
| 5. mist _____ | mist _____ |
| 6. zebra _____ | zebra _____ |
| 7. daisy _____ | daisy _____ |
| 8. elm _____ | elm _____ |

"Now let's have a test to see how much you have learned."

Test List

1. cypress _____
2. tornado _____
3. zinnia _____
4. cat _____
5. frost _____
6. poppy _____
7. elephant _____
8. sycamore _____

Generalization:

1. Weather words are 75
2. Tree words are 28
3. Flower words are 91
4. Mammal words are 47

Task Materials: CF--1L (continued)

Trial List 4

- | | |
|-------------------|----------------|
| 1. squirrel _____ | squirrel _____ |
| 2. mimosa _____ | mimosa _____ |
| 3. crocus _____ | crocus _____ |
| 4. drought _____ | drought _____ |
| 5. sweetgum _____ | sweetgum _____ |
| 6. humidity _____ | humidity _____ |
| 7. kangaroo _____ | kangaroo _____ |
| 8. aster _____ | aster _____ |

"Now let's have a test to see how much you have learned."

Test List

1. cypress _____
2. tornado _____
3. zinnia _____
4. cat _____
5. frost _____
6. poppy _____
7. elephant _____
8. sycamore _____

Generalization:

1. Weather words are 75
2. Tree words are 28
3. Flower words are 91
4. Mammal words are 47

Task Materials: CF--1L (continued)

Trial List 5

- | | |
|--------------------|-----------------|
| 1. fox _____ | fox _____ |
| 2. hurricane _____ | hurricane _____ |
| 3. magnolia _____ | magnolia _____ |
| 4. dahlia _____ | dahlia _____ |
| 5. spruce _____ | spruce _____ |
| 6. goldenrod _____ | goldenrod _____ |
| 7. cow _____ | cow _____ |
| 8. haze _____ | haze _____ |

"Now let's have a test to see how much you have learned."

Test List

1. cypress _____
2. tornado _____
3. zinnia _____
4. cat _____
5. frost _____
6. poppy _____
7. elephant _____
8. sycamore _____

Generalization:

1. Weather words are 75
2. Tree words are 28
3. Flower words are 91
4. Mammal words are 47

Task Materials: CF--1L (continued)

Trial List 6

- | | |
|---------------------|------------------|
| 1. giraffe _____ | giraffe _____ |
| 2. whirlwind _____ | whirlwind _____ |
| 3. dandelion _____ | dandelion _____ |
| 4. chinaberry _____ | chinaberry _____ |
| 5. nasturtium _____ | nasturtium _____ |
| 6. pecan _____ | pecan _____ |
| 7. fog _____ | fog _____ |
| 8. horse _____ | horse _____ |

"Now let's have a test to see how much you have learned."

Test List

1. cypress _____
2. tornado _____
3. zinnia _____
4. cat _____
5. frost _____
6. poppy _____
7. elephant _____
8. sycamore _____